M4D: how the mobile phone becomes a tool for development Focus on the Republic of Kenya

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MOBILE
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Kenya
Agriculture
Leapfrog
SMS
Africa
government
HUB

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SUMMARY and KEY WORDS

This paper gives a glance into Africa's mobile revolution and what it represents, for not only is the mobile phone leading to a transformation of the technological landscape but also of African society as a whole, as well as its economy. The paper tells the story of how the mobile phone empowers Africans to tackle their development challenges, acting as an enabler to find innovative and locally relevant solutions to long-standing issues. It highlights the mobile phone's impact on Africa's important economic sectors of health, education and agriculture, as well as finance –through mobile money. Focusing on Kenya, one of Africa's most advanced countries in terms of information and communication technologies, illustrates the mobile revolution's full extent, with its opportunities and its challenges.

Key words

Africa, communication, development, entrepreneurship, FrontlineSMS, GSMA Development Fund, ICT4D, iHub, incubators, Information and Communication technology (ICT), Innovation, Kenya, Kilimo Salama knowledge, M4D, m:lab, m-Agriculture, m-Education, M-Farm, m-Health, m-Learning, M-Prep, M-PESA, mobile applications, mobile money, Mobile phone, mobile revolution, Nairobi, SMS, Value Added Services (VAS)

GLOSSARY

AISI: African Information Society Initiative

ARPU: Average Revenue per User

BOP: Base of the Pyramid

BTS: Base stations

CCK: Communication Commission of Kenya

CPM: Community Power from Mobile

EASSy: Eastern Africa Submarine System

ECA: UN Economic Commission for Africa

GSM: Global System of Mobile Communications

IDRC: International Development Research Centre

ICT: Information and Communication Technology

ICT4D: Information and Communication Technology for development

IT: Information Technology

ITU: International Telecommunication Union

KEPI: Kenya Expanded Program on Immunization

KESSP: Kenya Education Sector Support Programme

M4D: Mobile for development

MDG: Millennium Development Goal

MNO: Mobile Network Operator

NEPAD: New Partnership for Africa's Development

NGO: Non Governmental Organisation

PDA: Personal Digital Assistant

SMS: Short Message Service

UAF: Universal Access Fund

VAS: Value Added Service

UNESCO: United Nations Educational, Scientific and Cultural Organization

UNICEF: United Nations Children's Fund

USSD: Unstructured Supplementary Service Data

WEF: World Economic Forum

WHO: World Health Organisation

WSI: World Summit on the Information Society

Introducing the African mobile revolution

"I would love to change the world, but they won't give me the source code."
Marie Githinji, iHubber, Kenya 2012

It starts with a technology boom: in 1994, Africa launched its first mobile phone network; it weighed 0,5kg and cost USD2,000.[1] As mobile phones were quickly spreading and getting more sophisticated in the North, Africa still had a very limited access to basic mobile phones – due to costs and lack of mobile networks. This trend is reversing as today, Africa has close to 500 million mobile phone users, approximately half of it total population. In a decade, Africa's mobile penetration rate has grown 20 points and now four out of five new mobile connections are being made in the developing world. [2]

These few figures reflect the dynamism of the mobile market in Africa, however the revolution does not only come from the technology itself but rather what it has made possible, what is sparked in the minds of Africans. The rapid spread of mobile phones has provoked two major changes in people's lives. As they become more available, mobile phones also got cheaper and started connecting people who were not previously connected, giving them a means of communications – a means to discuss, coordinate, get information and do business. On average 70 per cent of Africans live in rural and off-the-grid areas but have access to mobile phones, and 230 million households in Africa do not have bank accounts but again, most of them have mobile phones. If the potential of the mobile phone for off-the-grid rural and unbanked people is not necessarily obvious at first sight, the paper will demonstrate how it is truly an enabler for development.

In addition, it has created a new generation of technology-savvy young people who want to change Africa's landscape. As the twitter profile of Marie Githnji, a Kenyan developer and woman "iHubber", illustrates "I would love to change the world but they won't give me the source code". Linking both these changes have opened up a world of opportunities as this new generation is finding new ways to use and exploit the mobile phone's potential, not only as a communication tool but also as a more impactful information tool. This mobile revolution

[1] Praekelt Foundation report, 2012, Mobile statistics for Africa: http://www.youtube.com/watch?v=0bXjgx4J0C4
[2] GSM Association Development Fund website: http://www.gsma.com/developmentfund/

comes from within Africa, it has empowered its people to create a new environment and new communities, adapting the technology to their own needs and their own context.

Mobile technology is not only ubiquitous – reaching even the rural and remote areas – and increasingly affordable, but also has functionalities that are in tune with the African life style and traditional ways of communicating. The fact that Africa traditionally relies on oral communication guarantees the relevance of using the mobile phone. The short service messages (SMS), a service embedded in even the most basic mobile phone, have also been completely integrated into people's life as a cheap and efficient way to communicate with others.

The mobile phone's success is such that it has completely leapfrogged – or "cheetah- pole-vaulted"[3] – every other information and communication technology (ICT) which includes all telecom services such as telephone fixed lines and computers. Fixed telephone lines have been forgotten in favour of mobile telephones, the poor quality of landlines helping: on average, Kenya has 36 days of interrupted landline, lasting on average 37 hours. [4] Computers are not widespread in Africa due to costs, lack of internet-connection and lack of training. In 2011, it was estimated that mobile penetration was of 63 per cent against 3.6 per cent internet penetration.[5]

The predominant mobile technology used today in Africa is second generation mobile phones, and not smartphones. A basic mobile phone "can make and receive telephone calls over a radio link whilst moving around a wide geographic area. It does so by connecting to a mobile network provided by a mobile phone operator allowing access to the public telephone network."[6] The Global System for Mobile Communication (GSM) architecture also "offers a number of different services embedded in the standard and therefore available on all GSM compatible devices. These include SMS, text messages of up to 160 characters, and instant messaging using the Unstructured Supplementary Service Data (USSD) protocol".[7]

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[3] Rafael Capurro, "Information Ethics for and from Africa", African Information Ethics in the context of the global Information Society, Vol. 7 (09/2007), International Review of Information Ethics, p.9

[4] Jenny C. Aker and Isaac M. Mbiti, "Mobile Phones and Economic Development in Africa", Journal of Economic Perspectives - Volume 24, Number 3. Eté 2010, p 211

[5] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf, p 35

[6] Wikipedia: http://en.wikipedia.org/wiki/Cellular_network

7 The World Bank, "Maximizing Mobile", Report published following the 2012 Information and Communication for Development conference

Smartphones, differ from basic phones as they support a wider variety of services and applications, using mobile broadband access. Broadband access, or wireless Internet access, is still nascent in Africa as prices are high and the network coverage often not sufficient. Countries like Kenya and South Africa have the highest percentages of smartphone penetration but these are still pretty low; this paper will focus on what is most available today: that is, the basic mobile device.

Local developers and content service providers are doing wonders at overcoming infrastructure shortages and creating adapted value added services (VAS), or mobile applications (apps) supported by narrowband mobile communications through scaled-down Internet browsers, SMS, instant messaging using USSD, social networking and pay-as-you-go you-go mobile data access.[8] These mobile apps can vary from data collecting to SMS medical alerts or school exam quizzes and provide the mobile device with a new and crucial dimension in the age of information and knowledge societies.

These mobile applications are the mobile phone's special power, what makes it an enabler and an amplifier of development by providing everyone, anywhere and at anytime useful and relevant information, in addition to facilitated communications. This information makes for more efficient and productive markets. [9] Thanks to the different apps created, owning a mobile phone can enable one's business to grow, one's education and training to strengthen, one's health to improve.

Information and Communication for Development (ICT4D) appeared in the 1990s as international institutions started to notice the potential of ICT in stimulating growth in the developing world. It is only more recently that "Mobile for Development" (M4D) came about, as the mobile revolution rose in Africa and other emerging countries such as India. ICT4D and more specifically M4D do not follow the traditional definition of development, brought by the North to the South through humanitarian aid. On the contrary, they enable growth to come from within Africa, building sustainable ICT businesses, providing for their own people's needs.

[8] The World Bank, "Maximizing Mobile", Report published following the 2012 Information and Communication for Development conference , July 2012, p 12
[9] Annie Chéneau-Loquay, "Innovative ways of appropriating mobile telephony in Africa", French Ministry of Foreign and European Affairs and the International Telecommunication Union Report , 2010, p 21

The concept of M4D is all the more powerful as it supports, and perhaps nourishes, a new two-sided approach to development which seems to prevail today. On the one side, "the development paradigm has undergone a "shift to embrace the Human Development approach"[10], focusing on education and health rather than exclusively on national development. This approach suggests that people should be taken as a starting point. On the other side, development is not only about "delivering aid but also economic growth, broad based, inclusive growth that actually helps nations develop and lift people out of poverty."[11]

The Republic of Kenya, also called the "Silicon Savannah" with a population of 40 million and more than 28 million mobile users, is one of first countries of Africa to embrace so comprehensively the mobile revolution, developing its ICT sector and applying its innovations to the improvement of socio-economic growth. It is in Nairobi that the first mobile applications laboratory (m:lab) and innovation hub (iHub) were established, now expanding across Africa and proving the heart of innovation technology. Different inherent factors come together to create an enabling environment in the country to benefit from the mobile phone's potential. Some are common to all of Africa and others apply specifically to Kenya and its people.

Africa's social life is intense, based on oral communication and "the principles of sharing and caring for one another"[12] – Ubuntu – which makes the mobile phone well suited to the needs of the continent.[13] Its population is young with 50 per cent of its population under 20 years old.[14] This is an advantage in the mobile world "where new trends are first taken by the youth".[15] Kenya has some more specific advantages of which a few can be listed. In addition to being young, many Kenyans speak English as a second language, as it is taught at school. This is an asset in the digital era where "English has become the lingua franca".[16] Kiswahili,

[10] Kutoma Jacqueline Wakunuma, "Using ICTs to Enhance Healthcare in Zambia", Africa Media Review, Volume 16, Number 2, 2008, pp. 29–48 Council for the Development of Social Science Research in Africa, 2008, p 30
[11] President Obama Speaks on Supporting Agriculture to Fight Hunger: http://www.youtube.com/watch?v=l4eNHmjOcig&feature=player_embedded
[12] Rafael Capurro, "Information Ethics for and from Africa", African Information Ethics in the context of the global Information Society, Vol. 7 (09/2007), International Review of Information Ethics, p.11
[13] Annie Chéneau-Loquay, "Innovative ways of appropriating mobile telephony in Africa", French Ministry of Foreign and European Affairs and the International Telecommunication Union Report , 2010, p.1
[14] Praekelt Foundation report, 2012, Mobile statistics for Africa: http://www.youtube.com/watch?v=0bXjgx4J0C4
[15] The World Bank, "Maximizing Mobile", Report published following the 2012 Information and Communication for Development conference, p.11
[16] Jacques C. du Plessis, "The Spirit of Open Access to Information as a Key Pillar to the African Renaissance",

the national language, is also well adapted to mobile communications as it uses the Roman alphabet, which makes it easy to text messages. Another determining factor is the passage of the submarine cable, running directly to the door step of Kenya and enabling high speed communications infrastructure. Spending a week in Nairobi is enough to realise the inherent entrepreneurial spirit on the streets, not only in the technology hubs.

This is the story of the mobile phone, its usage and its socio-economical impact, in Africa, a story that is written as it goes and is constantly evolving. What is true today might be out of date tomorrow. It is about how the mobile phone empowers a country's businesses to find new solutions to old social and economic problems. The paper focuses on the case of the Republic of Kenya as it acts as an eye-opener and a leader in the field of ICT and mobile technology, highlighting opportunities and challenges ahead, although evidently, each country of Africa has its own conditions to take into account.

First, the paper will introduce how the mobile revolution came about in Africa and its technological and social impact on the African and more particularly Kenyan societies. It will then illustrate the potential of the mobile phone by concrete examples in the "pro-poor development sectors"[17] of agriculture, health and education but also finance. Finally, challenges, past and future, for M4D to move ahead will be outlined as well as some of the innovative solutions that have already been thought of.

I –How did the African mobile revolution come about

A. 1995 to today: Realising the potential for ICT4D

While it did not take long to nurture thoughts, at the international, regional and national level, on how mobile phone could have an impact on Africa's socio-economic development, transforming those thoughts into reality has required some redefining of the concept of ICT4D.

African Information Ethics in the context of the global Information Society, Vol. 7 (09/2007), International Review of Information Ethics, p.179

[17] The World Bank, "Maximizing Mobile", Report published following the 2012 Information and Communication for Development conference , July 2012, p 22

1. At the International level

A year after the launch of the first mobile network in Africa, the International Community and actors of the private sector, gathered to discuss the development of a global information society, at the G7 Conference on the Information Society in Brussels. Thabo Mbeki, at the time Deputy President of the Republic of South Africa was invited to the conference, an invitation symbolising the fact that the entry into the information society was not reserved for the G7 members and other developed countries and that the debate about the information society was "of relevance to all humanity and therefore cannot ignore the position, the needs and role of the developing society." [18] However, despite the presence of a representative of the developing world, the conference was mainly focused on the developed countries' "smooth and effective transition towards the information society [as] one of the most important tasks that should be undertaken in the last decade of the 20th century".[19] At the time, to paraphrase M. Mbeki, there were more telephone lines in Manhattan than in all of sub-Saharan Africa, so talks about liberalisation, better infrastructure, regulations or interoperability were not quite yet at the same level of priority on the African agenda. M. Thabo Mbeki therefore suggested following up on this first meeting by convoking a new meeting which would reunite all representatives of the developing world along with G7 and EU members in order to discuss together the strategy, financing and international coordination to take on the challenge of worldwide information and communication technologies.[20]

In 1996, South Africa hosted the Midrand Conference on the Information and Development Society which launched an international dialogue to find common rules and priorities for development, for developing countries to enter the Information Society, instead of lagging behind and increasing the digital divide, i.e. the gap between those who have access to ICT and those who how do not have access to ICT. Every international organisations started exploring the role of ICT4D, including in specific sectors such as education, with the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and health, with the World Health Organisation (WHO).[21]

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[18] Ministerial Conference Summary, GT Ministerial Conference on the Global Information Society, 25-26 February 1995, Brussels. : http://aei.pitt.edu/33414/1/A161.pdf p 71.
[19] Idem, p 52
[20] Declaration at the Midrand Conference on Information and Development Society (ISAD) (Midrand, 13-15 May 1996), : http://www.osiris.sn/Declaration-de-la-conference-de.html
[21] The European Commission Communication to the Council and the European Parliament, "Information and Communication Technologies in Development, The Role of ICTS in EC development policy", Brussels

As the 21st century began, the international community started to take action. In 2000, the World Economic Forum (WEF), an independent international organisation based in Davos, Switzerland, launched the Global Digital Initiative in order to transform the digital divide into "an opportunity for growth". Following the Global Digital initiative, the United Nations created the UN ICT Task Force, a more legitimate body than the WEF in the eyes of developing countries, in order to develop effective partnerships with the private sectors, civil society and other relevant stakeholders.[22]

In parallel to the UN ICT Task force, the G8 Digital Opportunity Task Force (DOT Force) was created to examine "concrete steps to bridge the international digital divide" [23] and prepare a report for the next G8 Summit in Genoa, Italy in 2001. The report was the result of a collaboration effort of the G8 countries, the European Commission, nine developing countries – from Africa, Egypt, Senegal, Tanzania and South Africa were represented –, multilateral organisations, the private sector and Non Governmental Organisations (NGOs). It concluded that:

"when wisely applied ICT offered enormous opportunities to narrow social and economic inequalities and support sustainable local wealth creation, and thus help to achieve the broader development goals that the international community has set."[24]

The two following United Nations' World Summits on the Information Society (WSIS) held in 2003 in Geneva and 2005 in Tunisia lent credence to this conclusion, detailing the understanding of "wisely applied" as ICTs that are "people-centred, inclusive and development-oriented" with the following words:

"We reaffirm our desire and commitment to build a people-centred, inclusive and development-oriented Information Society, premised on the purposes and principles of the Charter of the United Nations, international law and multilateralism, and respecting fully and upholding the Universal Declaration of Human Rights, so that people everywhere can create, access, utilize and share information and knowledge, to achieve their full potential and to

14.12.2001: http://ec.europa.eu/development/icenter/repository/com2001_0770en01_en.pdf
[22] Idem
[23] University of Toronto G8 Information Center, : http://www.g8.utoronto.ca/dot_force/summary-nov-00.html
[24] The European Commission Communication to the Council and the European Parliament, "Information and Communication Technologies in Development, The Role of ICTS in EC development policy", Brussels 14.12.2001, : http://ec.europa.eu/development/icenter/repository/com2001_0770en01_en.pdf

attain the internationally agreed development goals and objectives, including the Millennium Development Goals. (Tunis Commitment, 18.11.2005)

Therefore, by the start of the first decade of the 21st century, the link between technology and development was well integrated. However, wisely applying ICT proves particularly challenging in a constantly changing context. In the last ten years ICTs has rapidly evolved and the rise of mobile phones has changed the landscape. To answer adequately this challenge, the World Bank created, in partnership with various international development agencies, InfoDev, a "tool to make sure ICTs are used the appropriate way."[25] InfoDev helped build a new ICT Strategy for 2012-2015, aimed "at helping developing countries use ICT to transform delivery of basic services, drive innovations and productivity gains, and improve competitiveness."[26]

The strategy is based on three pillars – Transform, Innovate and Connect. The first pillar, Transform, is "making development more open and accountable, and improving service delivery – for instance, education, health, and financial services". The second pillar, Innovate, is to develop "competitive IT-based service industries and foster ICT innovation across the economy – with a focus on job creation, especially for women and youth." Finally, Connect, will scale up "affordable access to broadband – including for women, disabled citizens, disadvantaged communities, and people living in remote and rural areas.[27]

This strategy's objective is to better answer developing countries' needs, as they are now more mobile than developed countries (see Annexe 3, page 81). It reveals ICT's potential to foster economic growth, in line with the shifting approach to development "from philanthropy to sustainability" in the words of the UN Foundation. Sustainability is not about any "green" ICT policy, as it might be considered in developed markets, but rather it consists in moving away from providing unsustainable aid and funding to projects and instead setting the conditions for projects to scale up and survive. [28] Barack Obama, in his speech at the 2012 G8 Summit, defined this new approach: "the whole purpose of development is to create the

[25] Josef Trommer, "Demonstrating Impact and Results", InfoDev Report, 10 June 2010
[26] World Bank ICT sector, bit.ly/NUwVRp
[27] Idem
[28] The United Nations Foundation and Vodafone Foundation, Vital Wave Consulting « mHealth for Development, The Opportunity of Mobile Technology for Healthcare in the Developing World», July 2009 p.16

conditions where assistance is no longer needed, where people have the dignity and the pride of being self-sufficient".[29]

The new approach not only introduces competitiveness and sustainability but also requires putting the people at the centre of the issue. As the first pillar explains, development is to be "more open and accountable". Adele Waugaman, Director of the Technology Partnership UN Foundation and Vodafone Foundation, confirms this shift in focus: "One of the most transformative aspects of the mobile communication revolution is that it puts individuals at the heart of humanitarian aid and development work."[30] This shift towards a two folded development approach is not only well integrated but also encouraged by this new ICT strategy for developing countries. This is when "ICT in development countries" becomes "developmental ICT", defined by M. Thompson and G. Walsham as "the conception, development, implementation and use of ICT as an explicit vehicle for furthering developmental aims".[31]

2. At the regional and country level

In the 1990s, Africa was, on the one hand, progressively entering the conversation with the members of developed countries on ICT policies for development and on the other hand, working on catching up and reducing the information and technological gap that separated it from the rest of the globalised world.

A few months after the 1995 G7 meeting, the African Regional Symposium on Telematics for Development was organised by the UN Economic Commission for Africa (ECA), together with the International Telecommunication Union (ITU), the UNESCO, and the International Development Research Centre (IDRC). The Symposium reunited over three-hundred information experts, senior government officials and private sector to conceptualise an African information infrastructure. After a first Resolution, published in 1995, on "Building Africa's Information Highway", in May 1996 the Resolution 812 "Implementation of the African Information Society Initiative" was released.

[29] President Barack Obama speaks on Supporting Agriculture to Fight Hunger: http://www.youtube.com/watch?v=l4eNHmjOcig&feature=player_embedded
[30] The United Nations Foundation and Vodafone Foundation, Vital Wave Consulting " mHealth for Development, The Opportunity of Mobile Technology for Healthcare in the Developing World" July 2009 p.14
[31] Mark Thompson, Geoff Walsham, "ICT Research in Africa: Need for a Strategic Developmental Focus", Judge Business School, University of Cambridge. Proceedings of IFIP WG 9-4, University of Pretoria Joint Workshop, p 129

The new approach to development was brought forward at the regional level, in 2001, with the launch of the New Partnership for Africa's Development (NEPAD) in Lusaka, Zambia: "NEPAD is a radically new intervention, spearheaded by African leaders to pursue new priorities and approaches to the political and socio-economic transformation of Africa." [32] One of NEPAD's priorities is to invest in ICTs as they "have opened new windows of opportunity for African countries to accelerate their economic growth and development".[33] The overall goal was to create African innovation by Africans and for Africans, with the help of ICTs.

The African Information Society Initiative's action plan was to respond to national needs and priorities in order to harness information and communication technology for development. It developed a National Information and Communication Infrastructure plan to encourage reform policies and the liberalisation of national telecommunications services to ensure "the establishment of adequate communication infrastructure"[34], after previous recommendations by the International Community.

Independent and autonomous regulatory bodies were put in place to manage the opening of the markets, which would have a positive effect at country level. Between 1990 and 2008, the number of independent ICT regulators rose by 93 per cent in Africa.[35] The idea was to shift "from the government institutions as the only suppliers of telecommunications services to the private sector operators based on competitive market forces."[36] Competitivity would bring development, provided rules were well defined and regulators efficient. As the ECA and the G8 DOT force warned, the process of liberalisation should ensure a design that would bring affordable access to ICTs.

In Kenya, the process of liberalisation, privatisation and independent regulatory reforms unrolled slowly, it was only after 1999, that the Kenya Communications Act went into affect. Then the National Communications Secretariat was established and the Communications

[32] The New Partnership for Africa's Development website: http://www.nepad.org/
[33] Idem
[34] The African Information Society Initiative Brochure, UNECA, 1996 : http://www.uneca.org/aisi/
[35]Valeria D'Costa, "Harnessing ICT to reach Africa's Development Goals", Information for Development Program (infoDev), Brussels, 24 March 2009
[36] Muriuki Mureithi, "Evolution of telecommunications policy reforms in East Africa: Setting new policy strategies to anchor benefits of policy reforms", Summit Strategies Ltd. Nairobi, Kenya , 2002. http://link.wits.ac.za/journal/j0301-muriuki-fin.pdf p2

Commission of Kenya (CCK), started acting as a regulator.[37] The liberalisation process, in the short term, appeared as the solution to boost development but also entailed risks that are still being dealt with today. Policy reforms have had a positive effect on the telecommunication infrastructure – expanding it, allowing price to go down, opening the market to competition and clarifying the role of the government in relation to the private operators.

However, the long term strategy did not prove entirely successful. A 2002 study analysing the evolution of telecommunication policy in East Africa with regards to development concludes that "the policy design did not provide tools to intervene in the market in the consumer interest (…) [and] competition has resulted in a significant consolidation of market power with a consequent shift of monopoly power from government to the private sector."[38] Indeed if the intention of liberalising was to remove the state monopoly in Kenya, its main operator, Safaricom, took the lead. Safaricom's monopoly is still effective today, as it possesses 80 per cent of the market[39] (see Annexe 2, page 80), to the point that one of the latest World Bank report (July 2012) recommends more regulations to put an end to an unfair monopoly.[40] This monopoly can have some negative effects as the operator dictates the "terms of the product".[41]

This said competition does operate in Kenya, notably through price wars, making prices go down, to the customer's benefit. In September 2010, Safaricom was "forced into selling outgoing minutes at 22 per cent marginal loss after dramatic reductions in outgoing and incoming call rates as a result of a price war with Zain" [42] (today called Airtel), the second biggest operator in Kenya. Regulators are also doing their part. In June 2010, Kenya's telecommunications regulator slashed the licence fee for third-generation (3G) mobile Internet services by 60 per cent to $10 million, in order to raise penetration – and announced that it would not charge for an upgrade to 4G.[43] Pricing pressures can only go so far and operators

[37] Sean Kane, "Telecom Reform and Poverty Alleviation in Kenya": bit.ly/P7YntS
[38] Muriuki Mureithi, "Evolution of telecommunications policy reforms in East Africa: Setting new policy strategies to anchor benefits of policy reforms", Summit Strategies Ltd. Nairobi, Kenya , 2002 : http://link.wits.ac.za/journal/j0301-muriuki-fin.pdf p2
[39] Katrina Manson, "Mobile phones: Potential for social change if networks can fix problems", *The Financial Times (UK)*, 27 October 2011
[40] Winfred Kagwe, "Kenya: Mobile Money Monopoly Unfair, Says World Bank", 19 July 2012
[41] Kevin Donovan, "Mobile Money for Financial Inclusion", Chapter 4 of The World Bank Report "Maximizing Mobile", published following the 2012 Information and Communication for Development conference p 68
[42] Karim Sabbagh, David Tusa, Milind Singh, Sandeep Ganediwalla, "Perspective.Connecting Africa. The Next 10 Years of Mobile Growth", Booz & Co Report, 13 December 2011, p7
[43] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf, p 55

are starting to invest in value added services so as to create customer loyalty, although prices remain a determinant factor.

Kenya's ICT policies are today going in the right direction in terms of providing the tools for an adequate and efficient development. After the violent elections of 2007, political parties committed to a new "national long term development blue-print to create a globally competitive and prosperous nation with a high quality of life by 2030, that aims to transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment": Vision 2030. [44]

KENYA'S VISION 2030

"Our dream"

Na TusirudiNyuma: We ask for a Kenya where our rights and freedom are protected, where we are ruled by democracy.

Ukulima Bora: We all want a Kenya that is able to adequately feed itself, the world and give jobs to its citizens.

Barabara za Kisasa: We all want a Kenya with a good network of roads that will enhance business within our country.

Utalii Wetu: We all want a Kenya flooded with tourists enjoying the beauty of our country and creating employment for us.

Bandari Zetu: We want a Kenya that is capable of bringing in more business and employing more Kenyans.

Masomo Bora: We all want a Kenya where our children are educated by well trained teachers who will help them realize their potential.

Matibabu kwa Wote: We want a Kenya, where all Kenyans can afford to go to well-equipped hospitals and get treated by qualified doctors.

Mawasiliano ya Kisasa: We all want a Kenya that is advanced in technology, where other countries look up to us for technology solutions.

Kenya's Vision 2030 seems to have integrated a development approach in which ICT is a part of the strategy while not the priority, instead focusing on education, employment, and healthcare. The last quote is the only explicit reference to technology and reflects Kenya's intention of providing leadership in the sector "Mawasiliano ya Kisasa". Kenya's Vision 2030 thus integrates the idea that ICTs, including mobile phones, are only a tool for increasing information flows and empowering the people, there are not end goals for development.[45] As the DFID (the British development agency) suggested, international development targets should be the priority, not the spread of technology or the bridging of the digital divide.

[44] Vision 2030 Kenya, http://www.vision2030.go.ke/

[45] Catherine Nyaki Adeya « ICT and Poverty : A literature review », PhD, Ottawa: Acacia Initiative, IDRC, 2002, p10

The one major ICT initiatives of Kenya's Vision 2030 is the construction of a modern ICT Park right outside of Nairobi, the Konza Technology City. The objective of the park is to "promote Kenya as a BPO (Business Process outsourcing) destination and increase Kenya ICT talent pool". This project is in line with the priorities of Kenya ICT Board, a state body created in 2007 and which has as overall objective for Kenya to become "a top ten global ICT hub."[46] The level of investment of the government in this project (estimates vary around KSh800 billion – USD9.52 billion) reflects its level of commitment to make ICT a major tool for the economic and social development of the country. As Dr. Bitange Ndemo, Permanent Secretary in the Ministry of Information and Communications, states: "ICT has contributed to global growth and democratization and is transforming governments and people's lives."

It took some redefining efforts to establish the grounds for ICT policies to be fully integrated into Kenya's broad strategy for national development and other factors were in play to make it happen. This background introduction presents one part of the picture: what was happening at the institutional level as ICT was spreading in Africa. As the paper will suggest as it develops, government is not the one and only actor of the mobile revolution but its part is essential to set the right framework and accomplish the 1985 oath made by world governments, including Kenya, to ensure that there would be "a telephone within easy reach by the early part of the 21st century".[47] As the Mobile Monday Report 2011 states: Kenya now appears with "renewed and stronger than expected growth on the back of a new constitution, strong macro-economic policies, and a favourable regional environment. The uptake of ICT throughout the economy could provide the impetus required for high and sustained growth." [48]

B. The mobile revolution: reshaping the African landscape

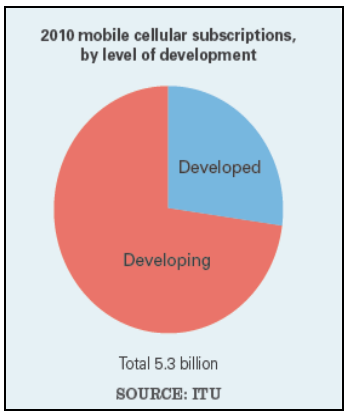
The African market and its people have completely adopted mobile technology, which has deeply reshaped the landscape. The mobile phone offers opportunities that no other information and communication technology can offer: it is ubiquitous and therefore increasingly affordable, making a tool initially destined for the elites, accessible to all.

[46] Kenya ICT Board website: http://www.ict.go.ke/index.php?option=com_content&view=article&id=178&Itemid=285
[47] "A 2010 Declaration of Broadband Inclusion for All" http://bit.ly/QmX8t3
[48] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf, p 55

1. Everywhere: connecting Africa, even the remotest areas

Mobile phones are everywhere in Africa as mobile networks have progressively spread across Africa thanks to operators' push to gain larger parts of the market. The mobile network is now considered as vast as that of Coca-Cola, known for being present in every corner of the world, including the most remote areas. Africa is the second biggest mobile market in the world – back to back with India – behind the United States, and the fastest growing, with 65 per cent mobile penetration. An eloquent video from the Praekelt Foundation suggests that there are more mobiles in Uganda than there are light bulbs.[49]

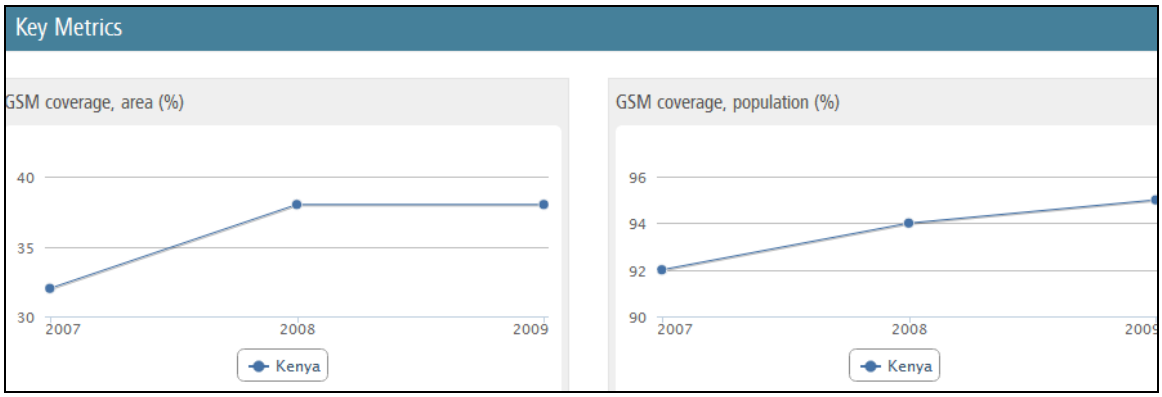
Rural and remote African villages have access to, at least, one mobile phone which the villagers will share, as the story of this one woman who owned a mobile phoned to keep contact with her husband who left the village for Italy and shared it with the rest of the community. Even the Maasai, an ancestral warrior tribe famous for their nomad and independent lifestyle, have access to mobile phones, as many mobile reports' covers show. Indeed the picture of a Maasai holding a mobile phone offers quite a mind-blowing contrast of tradition and modernity and reveals that reality in Africa is often different from conventional wisdom. If comparing figures with the developed world help grasp the reality of the mobile boom in developing country, the graph below reflects where the mobile communications revolution is happening:



In Kenya, the mobile penetration rate has grown at 20 per cent a year for a decade, driving growth above the 3,7% average for other sectors. The East Africa Submarine Cable System (EASSy) is an essential enabler of the mobile boom. Thanks to rigorous governmental action, the USD300-million project docked cables right at the doorstep of Kenya, as well as in Tanzania, Uganda, Mozambique, Madagascar, Djibouti and South Africa. The EASSy has

[49] Mobile statistics for Africa, Praekelt Foundation report, 2012,http://www.youtube.com/watch?v=0bXjgx4J0C4

completely changed the situation in those countries, enabling high speed communications infrastructure which are essential for various economic initiatives, lowering technology costs between connection points and offering more secure communication from point to point, even in remote and rural areas.[50] In 2007, there were no submarine connections in Kenya and the mobile phone landscape looked quite different, as the graphs below show (GSMA):



The mobile phone has leapfrogged landline phones as well as computers: mobile phones outnumber PCs 16 to 1.[51] Kenyans are jumping from paper records straight to mobile information because they are getting mobile phone towers before internet connection.[52] This unique situation is described in African terms not only as leapfrogging but more so as "cheetah-pole-vaulting" other information and communication technologies, reflecting the possibility to bounce even further ahead using local models and establishing locally adapted strategies to accelerate the development of Africa. Tim Kelly, the lead ICT specialist at the World Bank's InfoDev global grant unit explains the mobile's success suggesting that there are no adequate substitutes available and that, therefore, the mobile phone is "one of the keys unlocking Africa's development problems."[53]

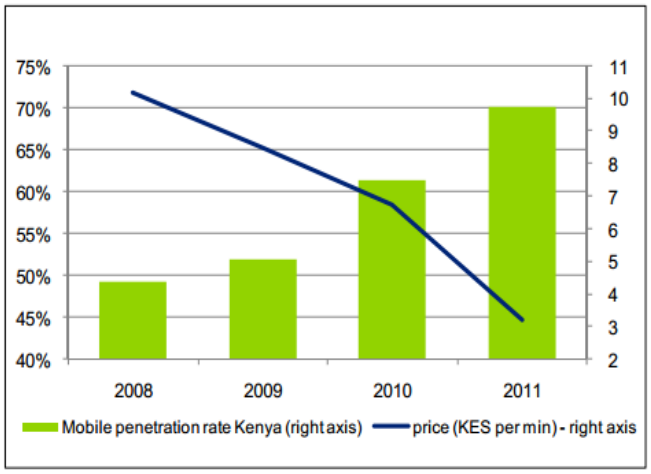
2. Everyone: from the elite to all

The spread of mobile phones across Africa has not only changed the ICT landscape but also the social landscape, as it made prices go down considerably and gave more people

[50] Claude Sassoulas, "Africa: the infrastructure that actually drives growth", BBC News, July 2012 : http://www.bbc.co.uk/news/business-18699197
[51] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf p53
[52] Lucas Oleniuk and Tim Alamenciak, "How the developing world is using cellphone technology to change lives", Toronto Star Newspaper, 24 March 2012
[53] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf, p 53

access to the technology. Compared to the first 1994 device at USD 2,000, a mobile phone today will not only be lighter but will also cost on average USD10-20. Prices have been dragged down, in part thanks to regulators' efforts to diminish license fees, in part because of price wars and competition between Mobile Network Operators (MNOs) which go as far as to organise price-cutting campaigns during religious events.[54] MNOs have completely changed their business model, "going from a wide profit margin with a limited user base (…) to a new model based on a narrow margin based on a broader customer base" [55], to adapt it to lower incomes. The pre-paid system was the first big innovation, allowing subscribers to buy airtime for very small amounts at a time. According to the Communications Commission of Kenya, pre-paid systems accounted for 99% of the total mobile subscribers, in Q4 2010.[56]

Figure 1: Des développements positifs dans le marché de la téléphonie mobile kenyan



Source : Wireless Intelligence and data from MNOs (Technologie sans fils et données des ORM)

The pricing trends are encouraging as for some people mobile phones can still represent a large part of their income. Indeed if the mobile phone is to positively impact socio-economic growth, it needs to reach everyone and especially those with the lowest incomes. The price of the cheapest mobile phone in Kenya costs half the average monthly income[57] and the average income user will spend 26,6% of its annual revenue on the mobile phone.[58] The mobile phone's price, even if too expensive for some, is justified by the fact that the device has some

[54] Chéneau-Loquay Annie, French Ministry of Foreign and European Affairs and the International Telecommunication Union Report on "Innovative ways of appropriating mobile telephony in Africa", 2010 p4
[55] Idem
[56] Idem
[57] Jenny C Aker and Isaac M. Mbiti, "Mobile Phones and Economic Development in Africa", Journal of Economic Perspectives - Volume 24, Number 3. Summer 2010, p 211
[58] Annie Chéneau-Loquay, « Les impacts de la téléphonie mobile sur le développement: un constat à nuancer? » La revue Proparco. Nov 2009

level of social value, which might explain in part why Africans are willing to pay a much greater portion of their income to access communication, compared to developed countries.[59]

However, as mobile phones are becoming accessible to an increasingly large part of the population, an equalitarian trend has started to appear transforming the device into a "democratic" tool which went from "an elite status symbol to a necessity for adults at nearly all income levels".[60] As the President of Rwanda Paul Kagame enounced in 2007 during the Connect Africa Summit: "In 10 short years, what was once an object of luxury and privilege, the mobile phone, has become a basic necessity in Africa."

The successful social adoption of the mobile phone in Africa is also in part due to the fact that the device is well adapted to African existent life style. Africa is based on oral communication and the mobile phone's primary function is to enable people to talk to each other, regardless of distances. According to Benjamin Steck, the oral tradition has even been boosted by the now immediate access to the wider world.[61] The mobile phone is in tune with the African principle of sharing as mentioned above; handsets are easy to share, especially since some have been equipped of multiple SIM cards to answer that need. In Kenya, one third of the population share their mobile phones with friends and family.[62] Furthermore, it does not require as high levels of education and literacy as the computer and internet do and can be financed on a pay-as-you-go basis.[63]

The risk that mobile phones will dehumanise face to face communication, pointed out by some mobile phone sceptics, is an almost inevitable global risk that every country that has entered the age of the information society faces. Indeed, in Africa, a person living in a urban city and who is now able to call his/her aunt living in a rural village will probably visit his relative less often. It is agreed that face to face communication is diminishing but contact is easier to keep and he/she will probably call the aunt more often. What is more interesting to

[59] Peter Kwaku Kyem, "Transforming Recent Gains in the Digital divide into Digital Opportunities: Africa and the Boom in Mobile Phone Subscription", EJISDC (2006), 28, 1-16

[60] Jenny C Aker and Isaac M. Mbiti, "Mobile Phones and Economic Development in Africa", Journal of Economic Perspectives - Volume 24, Number 3. Summer 2010, p 229

[61] Idem, p 6

62 Jenny C Aker. and Isaac M. Mbiti, "Mobile Phones and Economic Development in Africa", Journal of Economic Perspectives - Volume 24, Number 3. Summer 2010, p 212

[63] Peter Kwaku Kyem, "Transforming Recent Gains in the Digital divide into Digital Opportunities: Africa and the Boom in Mobile Phone Subscription", EJISDC (2006), 28, 1-16

note, is how the mobile phone is being adapted to Africa's traditions, customs and needs and how, by doing so, it has sprang a purely African mobile revolution, developing African solutions to stimulate African growth and answer to Africans' needs.

C. The mobile phone's added value

As the paper has begun to suggest, the spread of mobile phones everywhere and for everyone has had a strong social impact on African societies. If the mobile has an important social value for Africans, it also has much more; local developers and IT entrepreneurs have given the device a new dimension transforming a communication tool into a much more impactful information tool. The technology community, also referred to as "techies", have thus triggered the mobile phone's potential to stimulate economic growth.

1. Fostering a new generation: Reinventing Africa

"Now we (techies) need to liberate innovative thinking to reinvent Africa."

Herman Chinery Hesse,
Chairman of Softribes, a Ghana-based software company

One of the biggest social upheavals brought by the technology revolution is the realisation that owning a mobile phone could empower people. From that point onwards, Africa started thinking of the best ways to take advantage of the mobile phone's socio-economic potential and the private sector led the way developing technology hubs and incubators. Today there are more than 50 tech hubs, labs, and incubators in Africa and in Kenya alone there are six[64], providing a space for African-based "techies", entrepreneurs and investors to meet and develop innovative solutions to longstanding issues. (See Annexe 1, p 80)

In 2008, as Kenya was stabilising its regime and the EASSy was put in place, technology hubs and incubators started proliferating in Nairobi. The iHub, was the first African innovation hub to be created, funded by Ushahidi, the successful crowd-mapping company. It is part of a larger consortium comprising, eMobilis, the World Wide Web Foundation, the

[64] Erik Hersman, "From Kenya to Madagascar: The African tech-hub boom" http://www.bbc.co.uk/news/business-18878585

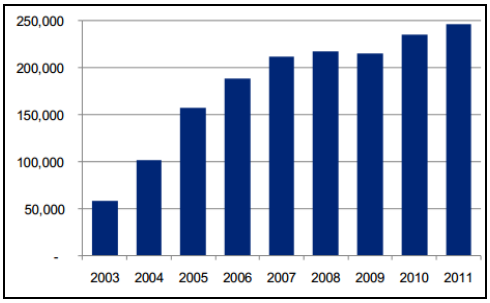
University of Nairobi's School of Computing and Informatics and the latest m:lab. Each body has a specific mission and all embody the country's push towards a high-tech information society, encouraged by Kenya ICT Board. The eMobilis, in partnership with the Web Foundation, has for objective to "increase the skill set of mobile applications developers through training and accreditation" while the University of Nairobi's School of Computing and Informatics carries out regional research studies on the mobile niche in East Africa."[65]

Interviewing Tosh, iHub's community manager, gives a sense of how the tech community has grown in Kenya, especially in Nairobi and what it wants to achieve. The iHub provides a physical space and a voice for IT entrepreneurs, techies, investors and big tech companies (such as Zuku, Nokia, Google, Safaricom, Samsung) to meet and share about their projects and ideas. Expanding in no time from a space with a few cocktail tables and internet to a smart-looking and professional open space, the iHub establish a membership system to regulate and structure the space as the number of members went from 0 to 8,000 today. There are white, green and red members (like the flag of Kenya, which they realised only later). The white members have virtual access to the iHub and come for events. The green members, the majority of "ihubbers", have daily access to the space where they meet, connect and bring ideas. They do not pay an access fee but need to spend 10 per cent of their time at the iHub working on a project with social value, with other ihubbers. These projects are assessed every Monday during the "show & tell" sessions. Red members, pay 10 000 Ksh a month for a reserved space they use as offices. The iHub's overall objective is to give the first push for entrepreneurs and start-ups, providing them with the right space and the right people to create sustainable business models.

Projects incubated at the iHub are not development-oriented *per se* and at times seem to not take into account the reality of the majority of Kenyans – perhaps due to the innovation divide between Nairobi and the rest of Kenya. However, as Tosh highlights, the creation of User Experience laboratory within the iHub, along with the already running Research laboratory, should better focus projects on answering the needs of all Kenyans. And if projects are not necessarily focused on development, they do encourage growth by helping techies develop their marketable skills, as the iHub report explains this space can be used as a stepping stone

[65] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf, p 53

for "talented entrepreneurs graduated with no formal job opportunities"[66]. The graph below highlights the impact of ICT on growth employment since 2003:



Contribution to the employment sector, 2003-2011 (Source: Deloitte)

Laboratories focusing more specifically on mobile technology came much later as the mobile phenomenon became obvious across Africa. Nairobi's m:lab was launched in June 2011, as part of a partnership between the mobile network operator (MNO) Nokia, the Finnish government and the World Bank's infoDev. This regional mobile application laboratory is one of a series of five, two in Africa (South Africa and Kenya) and three in Armenia, Pakistan and Vietnam and has for objective to boost innovation in the mobile sector. [67] The m:lab focuses on mobile entrepreneurs and provides a shared space for start-ups to incubate and network with mobile ecosystem players or other technology entrepreneurs. They help foster innovation and bring new mobile applications to the market, adapted to local needs, i.e. low-cost and high value. [68] As Tim Kelly, lead ICT specialist at The Word Bank's infoDev global grant unit, explains: "We hope to increase the competitiveness of innovative enterprises in the mobile content and applications area, and to ensure that locally relevant applications are created to meet growing developing country user demand."[69] Today, the m:lab hosts Pivot 25, the biggest East African Tech Conference, which has for objective to bring light on mobile developers and the East African entrepreneur community.

Kenya's tech community, represented by the m:lab, the iHub or the NaiLab, Nairobi's start-up accelerator, are the engines of the ICT revolution happening in the country, reflecting what is happening – with different degrees- in the rest of Africa. This community symbolises Kenya's

[66] IHub Research " The impact of ICT Hubs on African entrepreneurs" : a case study of iHub (Nairobi)

[67] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf, p 52
[68] Kevin Donovan, "Mobile Money for Financial Inclusion", Chapter 4 of The World Bank Report "Maximizing Mobile", published following the 2012 Information and Communication for Development conference p 79
[69] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf p 45

innovative and entrepreneurial spirit today and people like Tosh, Jessica Colaço, managers at the iHub, or Susan Oguya – co-founder of M-Farm are spokespeople of Kenya's leading role in Africa's ICT sector. Though recent initiatives, these incubators illustrated the nature of the revolution: putting people in the central stage, empowering them to create their own solutions, through applications and mobile services, in order to answer their own needs.[70] It is a new bottom-up approach to socio-economic growth, and the end of the traditional "white collar myth" leaving the space for the next IT generation to work "wearing ripped jeans and T-shirts".[71]

2. The mobile "app" revolution

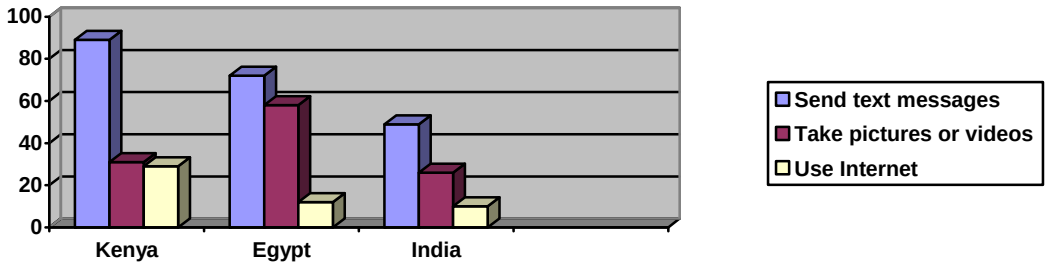
"Even the simplest, low-end mobile phone can do so much (…) in the developing world"

Fr Hamadoun Touré, ITU Secretary General

With the mobile revolution comes the mobile app revolution and this is where most of the mobile phone's development potential resides. As in wealthier countries, applications are often for entertainment; in lower-income countries these applications can provide opportunities to disseminate relevant sectorial and local information which can have an economic impact on people's lives.

From simple voice or SMS-based to more complex internet-based, mobile applications are offering one of the mobile's strongest added value, especially in such important economic sectors for Africa as agriculture, health, education and finance. Thanks to the rise of inexpensive smartphones (USD100) and the spread of mobile broadband, there has been a shifting focus over to Internet-based applications in Africa[72]. This paper will mostly concentrate on mobile apps using either, SMS-based or voice-based services, rather than Internet-based services in order to remain relevant to African demographics.

[70] Chéneau-Loquay Annie, French Ministry of Foreign and European Affairs and the International Telecommunication Union Report on "Innovative ways of appropriating mobile telephony in Africa", 2010 p29
[71] Erik Hersman, "From Kenya to Madagascar: The African tech-hub boom" http://www.bbc.co.uk/news/business-18878585
[72] The World Bank, "Maximizing Mobile", Report published following the 2012 Information and Communication for Development conference, p.xi



Mobile phone usage around the world", graphic based on World Bank Data 2011

It is worth focusing on SMS as although many more "glamorous" applications are created today, text messages or SMS remain "a popular and profitable non-voice application" which offers a reliable way to reach out to the majority of people.[73] As Laura Walker Hudson, CEO of the foundation providing the open source FrontlineSMS software defends: "We hear every second Tuesday about how SMS is dead and will be dead by 2015 and how this is linked to the rise of mobile data. But there are places where the only communication you can receive is by SMS. The most vulnerable people in society are still using low-end handsets, and SMS is still the most powerful (form of communication)." "It's very intimate because you get the message straight to a person, which makes it more powerful than e-mail."

An SMS counts up to 160 characters and can be sent from one mobile phone to another. These messages can be used to communicate, inform, and share knowledge on various aspects of economic life, especially for those in isolated and rural locations. "The SMS function is generally bundled into the price of a subscription or prepaid package; in many, but not all, developing countries, SMS costs a small fraction of the price of a voice call and can be sent asynchronously, that is, without the caller and the called party having to be online at the same time."[74] Another type of messages uses Unstructured Supplementary Service Data (USSD) and has functionality similar to instant messaging - these will not be studied in this paper.

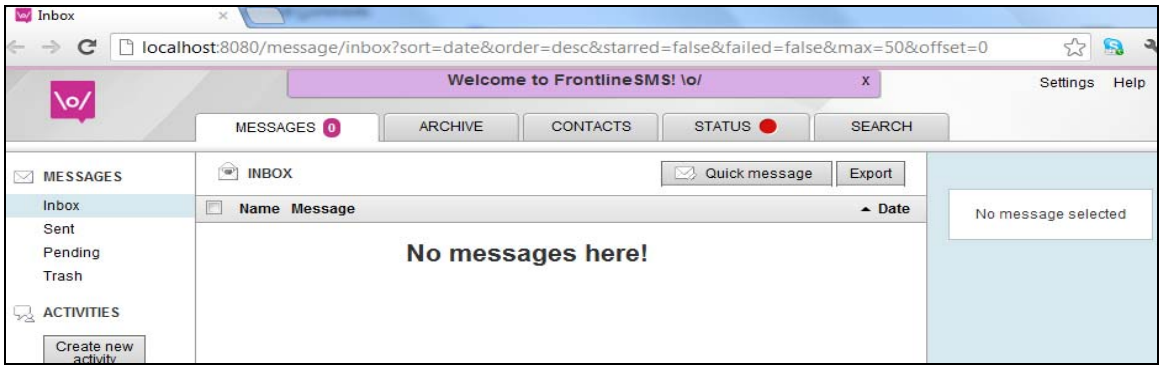
In Kenya, 89 per cent of send text messages versus 31 per cent who take pictures and 29 per cent who use mobile internet (see graph above).[75] Today "a wedding invitation, a death

[73] Idem p.14
[74] The World Bank, "Maximizing Mobile", Report published following the 2012 Information and Communication for Development conference, p 32
[75] The World Bank, "Maximizing Mobile", Report published following the 2012 Information and Communication for Development conference, p 14

announcement, or simple greetings, are now being sent by SMS".[76] The success of the now worldwide NGO FrontlineSMS reflects the fact that SMS are still a powerful and extendedly-used service, especially in developing countries.

The founder of FrontlineSMS, Kevin Banks, came up with this piece of software while working at the Kruger National Park in South Africa in 2004. He realised the need for the park authorities to engage with all the Kruger's communities regarding poaching activities; a difficult and time-consuming task when the only mode of communication is face to face. FrontlineSMS was thus created, as a free and not internet based platform, to enable communication with up to a thousand people (via outgoing bulk SMS) while helping to easily manage multiple responses (incoming bulk SMS).

Sharon Langevin, manager at FrontlineSMS: Credit, describes the advantages and particularities of the software. SMS are more powerful as they allow communication not only in between individuals but also in between whole communities. FrontlineSMS answers to the need of organisations to communicate with their larger audience directly and therefore is essentially used as a customer relationship management tool. NGOs count for 78 per cent of FrontlineSMS users [77] and appreciate SMS on the field, where there are not always computers and if there are any, staff members are unlikely to be close by. The software requires minimum equipment: a computer and a GSM modem, or mobile phone. Once the computer and the mobile phone are connected, via USB, all SMS received or sent are synchronised and organised on the FrontlineSMS platform, which looks like a Gmail account:



[76] Chéneau-Loquay Annie, French Ministry of Foreign and European Affairs and the International Telecommunication Union Report on "Innovative ways of appropriating mobile telephony in Africa", 2010 p 6
[77] Jamillah Knowles, "FrontlineSMS launches Version 2 with upgrades based on the advice of its users, The Next Web Blog 12 June 2012, http://thenextweb.com/insider/2012/06/12/frontlinesms-launches-version-2-with-upgrades-based-on-the-advice-of-its-users/

In 2010, five years after it launch online, FrontlineSMS decided to adapt its software to four main specific industries and sectors: finance (FrontlineSMS: Credit), education (FrontlineSMS: Learn), legal (FrontlineSMS: Legal), and media (FrontlineSMS: Radio). Sharon Langevin's sector, Credit, enables organisations to easily manage mobile money. By connecting with local mobile payment systems via SMS, users are able to send and receive mobile payments from the FrontlineSMS platform, but also manage transaction data. And FrontlineSMS continues to grow and evolve, as it launched a new easier version of the platform's services in June 2012.

In Kenya, where Mrs. Langevin is based, FrontlineSMS is widely used, notably because Kenyans have a high mobile-dexterity and Swahili is a language easily to text. Plan International, a global NGO dedicated to improving the lives of children around the world, has integrated FrontlineSMS into some of its key programme areas. Since 2008, the NGO has been using FrontlineSMS, combined with Ushahidi's digital crowd-mapping platform, for birth registration in Kenya. As Ushahidi does no have an SMS interface, FrontlineSMS provided the tool to collect messages sent from mobile phones. [78]

By transforming a mobile phone into "a central communication hub"[79], only using SMS, FrontlineSMS proves the potential of the mobile phone, even at its most basic level, as a tool for social change. Additionally, as FrontlineSMS provides a platform, other tools such as mobile money payments or crowd-mapping services can be added on, enhancing further the power of mobile phones. As Pieter Streicher, MD of BulkSMS, describes: "SMS is more efficient than other means of communication". This explains why Frontline SMS software has now been downloaded more than 25.000 times in 80 different countries.

However, Mrs. Langevin does caution: technology only accounts for 10 per cent; proper implementation counts for the remaining 90 per cent. Proper implementation requires constantly remembering the context and making sure that users can adopt the technology. As the NGO Plan International suggests as a key learning, for ICT tools to deliver their "invaluable" potential, "they must rest on an existing information and communications flow, and be part of a comprehensive approach that recognises the true capacity of stakeholders."[80]

[78] Case study, www.frontlinesms.com
[79] Michelle Risinger, " Developing countries and SMS technology", Magazine Global Politics.uk, Février 2012, http://www.global-politics.co.uk/blog/2012/02/23/sms_id_mr/
[80] Case study, www.frontlinesms.com

This is the story of how African countries have been given the opportunity to build their own development models, via ICT tools and especially the mobile phone, moving away from an "aid-only" towards self-sustainable approach. Interestingly, although establishing sound institutional grounds is a pre-requisite for technology to be adequately integrated to a country's growth strategy, the main driver of the revolution is Africa's entrepreneurial society, growing its knowledge from the practice and use of technology. This process can be described as "innovation through use", which Dominique Cardon defines as "technological and service innovations that come about as a result of user practices and are disseminated through the exchange networks between users."[81] This is why looking at practical case studies is the best way to understand how mobile phones concretely changed people's lives in Africa and what impact this technology has on a country such as Kenya.

II – M4D: How mobile phones change lives by helping create the conditions for better dvt

The proliferation of mobile phones in Africa has been raising great hopes for improving socio-economic development. As the paper has been suggesting, confirming the 2009 World Bank report, the mobile device appears as the most adapted tool for stimulating Africa's growth. In practice, how is the causal link has been established between information technology and development[82] reflected?

Mobile phones have a direct impact of the economy as they help create new jobs and widen markets by linking fragmented markets, at every level (local, regional and international). Most importantly, they provide new ways to deliver information and increase information flows. Appropriately used, they can, have an indirect impact on some vital sectors for development in Africa, among which education, health and agriculture. Applied to those sectors, mobile phones reduce transaction costs and prices by facilitating delivery of services, improve efficiency and respond more adequately to shocks (e.g. environmental disasters). As the following case studies show, the use of ICT has the most economic and

[81] Chéneau-Loquay Annie, French Ministry of Foreign and European Affairs and the International Telecommunication Union Report on "Innovative ways of appropriating mobile telephony in Africa", 2010 p 3
[82] Catherine Adeya Nyaki « ICT and Poverty : A literature review », 2002 Ottawa, Canada, IDRC.

social impact on small-scale companies, which in turn embodies the business model and "the way of life of millions of people in developing countries."[83]

Kenya has been integrating digital technology to each of these sectors in order to increase their efficiency and productivity. Indeed, stakes are high as a study of Kenyan businesses suggests: losses incurred as a result of poor telecommunication are on average 110 times higher that the total cost of providing adequate telephone services and amount to an average of 5 per cent of turn-over.[84] In its efforts to become a high-tech and middle-income country, Kenya offers an insightful example of some of the best mobile initiatives in Africa.

A. Mobile money in Kenya: the success story of M-PESA, its role as an eye opener for all other mobile projects

1. M-PESA: Unveiling the mobile phone's potential

> *"Mobile phone technology has in a few years of its existence demonstrated how financial inclusion can be leapfrogged on a major scale and in a short time span using appropriate technological platforms."*
>
> Njungunua Ndung'u,
> Governor, Central Bank of Kenya

Transforming the mobile phone into a "wallet"[85], allowing mobile owners to make money transactions with a mobile phone, has opened the door to a new innovative and audacious thinking about the use of technology, before any of the benches of African tech hubs were put in place. The idea for mobile money came in 2003, with the realisation that access to communications facilitated entrepreneurship and could "create wealth through bottom-up activity".[86]

Finding a business model that would be profitable while having a development impact was a very innovative and disruptive concept and it took time to deliver the right model for Kenya.

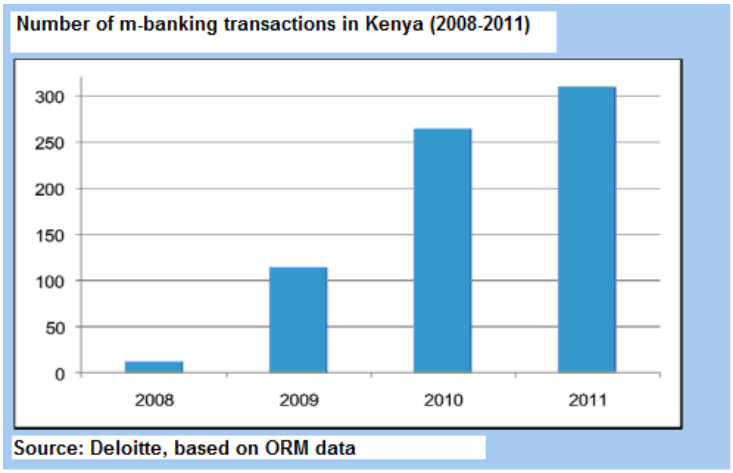
[83] Annie Chéneau-Loquay, French Ministry of Foreign and European Affairs and the International Telecommunication Union Report on "Innovative ways of appropriating mobile telephony in Africa", 2010 p12
[84] Peter Kwaku Kyem, "Transforming Recent Gains in the Digital divide into Digital Opportunities: Africa and the Boom in Mobile Phone Subscription", EJISDC (2006), 28, 1-16
[85] The World Bank, "Maximizing Mobile", Report published following the 2012 Information and Communication for Development conference , July 2012
[86] Tonny Omwansa and Nicholas Sullivan "Money, Real Quick. The story of M-PESA", The Guardian, e-book, 2012

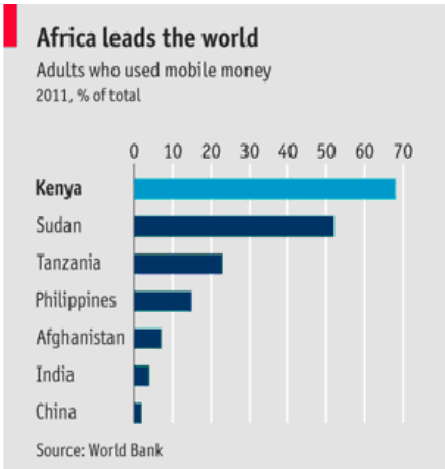
Customisation and processes needed to be improved and anti money laundering systems needed to be implemented. Also, it was difficult to advocate for an "Africa-customised" service with a European centric network operator – Safaricom, the operator which developed M-PESA, is owned at 40% by the British operator Vodafone.[87] By 2007, M-PESA ("M" stands for mobile and "pesa" means money in Kiswahili), was the first money transfer service and payment service using mobile phones launched in Africa. A year after, it "all started to get big" as Tonny Omwansa, author of M-PESA's biography, explained during an interview.

In an environment which can prove risky, going cashless – at least in part – is a brilliant solution. Not only does it make money transactions less hazardous, but it also enables people to save huge amounts of time and money. While sending money – remittances – to the home village for instance, meant giving cash to a travelling member of the family, a friend or even a bus driver, now, it can be sent directly through the mobile phone. Mobile money saves time, e.g. the time it takes for the money to get transported to the village, or the time waiting at the ATM queue to cash in; and money, e.g. the cost of the bus fare or, at times, the cost of the money never getting to its final destination.

Today, 19 million Kenyans (nearly 70 per cent of the adult population) have subscribed to mobile money services, 16 million of which are customers of M-PESA. The other 3 million mobile money users are distributed between the operators Orange, Yu and Airtel. Safaricom provides its customers with more than 30,000 agents across Kenya (versus 1,500 Bank ATMs), to whom customers can go to change their cash into e-money (otherwise called e-float) and vice-versa. Once subscribed to an M-PESA agent by providing an Identity Card, the subscriber gets a PIN number. To send money – to "M-PESA" as it has become a verb – or airtime to another account is much like sending an SMS. The sender buys airtime, or gives cash to the agent who will then transfer it to the beneficiary's M-PESA account, who can go and get it at the nearest M-PESA agent. In 2011, USD10 billion were moved through M-PESA and during the holiday season, Safaricom recorded 285 M-PESA transactions per second.[88]

[87] Idem
[88] Idem





The fact that M-PESA users do not need to have a bank account to transfer money offers a huge new opportunity for the economic development of Kenya, as it taps into the until-then-untouched informal economy which represents a majority of the population as only 19 per cent of the Kenyan population is banked. Now, most of the money in circulation is inserted into the formal market, as money transactions are registered and the mobile money service is profitable thanks to a small 1 to 3 per cent transfer fee.[89] Mobile money has thus helped move cash "from the mattresses to the market".[90] And although the users of M-PESA were initially wealthier, banked and urban citizens sending money back to their villages, this pattern has progressively changed and is now more representative of Kenya's demographics. The social and economic changes due to the entry of M-PESA in Kenya's lifestyle may temper fears that M-PESA would increase the digital divide rather then diminish it and would promote the informal economy. The story below illustrates how M-PESA can change and facilitate one's life.

"Kiogothe has been a makanga— public service vehicle co-driver—since he was 18 years old. He's up by 4 a.m. and not in bed until late, sometimes past midnight. Makangas are known to be very rowdy and ruthless, a fact that Kiogothe confirms. After collecting money from passengers, he would instill fear in them with rough talk and physical gestures, so that no one would rob him. Behaving tough, he says, was a requirement for the job.

[89] Annie Chéneau-Loquay, French Ministry of Foreign and European Affairs and the International Telecommunication Union Report on "Innovative ways of appropriating mobile telephony in Africa", 2010 p22
[90] Wolfgang Fengler, "Kenya: How Kenya Became a World Leader for Mobile Money", Capital FM Magazine, 17 July 2012

When he closed out around midnight, he would pay his driver a salary for the day and carry the rest of his money home. The next day he would deposit the money in his employer's account at midday, when there is not much matatu (small bus) business. He'd stand in line for at least 30 minutes because the banks were busy at midday.

Kiogothe often lost his whole day's earnings to robbers. His next-day salary would be used to pay off his employer, who grew tired of his antics and tales. Kiogothe had to quit the job and started selling second-hand shoes in a market. But he couldn't make ends meet and went back to the makanga business. This time, he was much more aggressive defending himself against robbers, but was jailed several times for hurting people and paid large fines.

That was before M-PESA. Now, Kiogothe performs his duties with respect for his customers. By 8 in the morning, several M-PESA shops have opened. He deposits all earnings up to that hour. As the day progresses, he deposits money along the way. As passengers board his matatu, he goes to one of the M-PESA shops and deposits the money. During midday, when there is no business, Kiogothe now relaxes instead of visiting the bank, waiting for the evening when business is booming.

Around 8 pm, when the last M-PESA shop closes, he makes his last deposit. He keeps any other money that he may earn from there on and deposits it the next morning. Once home, using his mobile phone, he transfers money from his M-PESA account to his employer's M-PESA account. With M-PESA, he keeps his accounts straight and his earnings safer. And he stays out of jail."

"Money, Real Quick. The story of M-PESA", Tonny Omwansa and Nicholas Sullivan Nicholas, The Guardian books, 2012

A part of M-PESA's success is due to the fact that the practice of transferring money via mobile phone is "a continuation of the traditional and long-established practice of transferring money via intermediaries"[91]. People transferred money, between the town and the village and back, before the arrival of mobile money. Remittances are anchored in African people's habits and lifestyle, as they "not only improve household welfare but can also have indirect growth effects on the economy" by stimulating local demand and providing the community with a

[91] Annie Chéneau-Loquay, French Ministry of Foreign and European Affairs and the International Telecommunication Union Report on "Innovative ways of appropriating mobile telephony in Africa", 2010 p 4

source of credit.[92] Interestingly, although most often the remittances are sent from urban to rural areas, during the election period in Kenya, in 2007, the flow of remittances changed and it was now the rural areas sending money to the urban dwellers as banks were closed, for weeks due to the violence on the street. The service is answering a need and makes it faster, cheaper and safer. M-PESA's success in improving already existent social habits proves that a product will always work better if it answers existing needs.

Another reason of its success in Kenya, aside from Safaricom's widely extended network, is that the service relied on people, the 30,000 agents that work with – and not for –M-PESA, and trust. As Wolfgang Fengler, World Bank's Lead Economist for Kenya, explains: "Many innovations fail because they focus exclusively on designing and launching the product, and assume that technology will take care of itself afterwards. The opposite is true." Being able to manage its network of agents and making it quickly grow from 300 to 30,000 is Safaricom's secret to success. [93] It has created thousands of profitable jobs for local shops and vendors, which generating an environment of trust, giving legitimacy to M-PESA and ensuring adoption by the customers. Trust is an essential factor for social appropriation, "the process that leads to the social transformations that occur as a result of using ICTs."[94] If Kenyans are reluctant to embrace any other e-commerce tools, such as credit or debit cards, it is due, in part, to a lack of trust, as well as "delivery bottlenecks."[95] According to a person working on implementing debit cards in Africa, Kenya is the most difficult market to enter, because of M-PESA.

2. Mobile money is changing the structure of the economy

As East African banks have been slow at integrating mobile and Internet technologies in their structure, hubs and incubators have taken the lead with software developers who are "making the connection between e-commerce and mobile payment systems."[96] Zege

[92] Olga Morawczynski, "Surviving in the 'dual system': How M-PESA is fostering urban-to-rural remittances in a Kenyan Slum", Science Studies Unit, University of Edinburgh. Proceedings of IFIP WG 9-4, University of Pretoria Joint Workshop, p 111-112
[93] Wolfgang Fengler, "Kenya: How Kenya Became a World Leader for Mobile Money", Capital FM Magazine, 17 July 2012
[94] R.W Harris, "ICT for Poverty alleviation" 2004: http://www.apdip.net/publications/iespprimers/ICTs4PovertyAlleviation.pdf
[95] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf p 34
[96] Idem p 29

Technologies for example, is a Kenyan software that makes mobile payments easier across software platforms and banks. M-KESHO is another unique service, based on M-PESA's system. Until then, money was deposited on M-PESA's account without perceiving any interest rates. It was a good way to exchange money but not necessarily to make savings.[97] M-KESHO enables people with no bank account to get credit and save money. A subscriber can deposit as little as 100 Kenyan Schillings (USD1,25) and receive an interest rate of 1 per cent, which is not much but represents a true opportunity for the unbanked to join the banked. The rate of interest also varies, and can go up to 3 per cent for a deposit of more than 100,000 Ksh (USD1,190). The subscriber to the service can also take out small loans (even without being a client of Equity Bank) by sending a SMS request to Equity Bank. The loan rate will be calculated based on a review of his/her last six months M-PESA/M-KESHO transactions, which act as credit history.

Mobile micro-loans have been in services for a few years now, but M-KESHO's novelty comes from the official – although not always simple – partnership between Safaricom and Equity Bank (Kenya's largest bank) which enables the service to scale up. This partnership presents advantages, such as the ability to scale up and reach as many people as possible, but also limitations, as the service can only be used with those two companies.[98]

Another fascinating financial product, which required partnering with M-PESA, is the "Tone Kwa Tone Pata" Pump (Drop by Drop Gets the Pump) created by the NGO's KickStart. It is a pedal-powered pump which allows a single smallholder farmer to irrigate up to two acres in eight hours: a 16 fold increase in efficiency over manual irrigation methods. A big pump cost USD105 (an average 3-month wage) and a small pump cost USD40. Since 1998, 64,500 pumps have been sold and the average rise in farm income is of 1,100 per cent. Partnering with M-PESA has allowed the payment of the pump to be made over 3 months and if the farmer drops out, he will be refunded. This allows small-hold farmers to invest and save money.[99]

[97] Mathilde Cristiani, "M-Kesho fait du porte-monnaie mobile un véritable compte bancaire", 20 May 2010, http://www.atelier.net/trends/articles/m-kesho-porte-monnaie-mobile-un-veritable-compte-bancaire
[98] Mathilde Cristiani, "M-Kesho fait du porte-monnaie mobile un véritable compte bancaire", 20 May 2010, http://www.atelier.net/trends/articles/m-kesho-porte-monnaie-mobile-un-veritable-compte-bancaire
[99] Tonny Omwansa and Nicholas Sullivan "Money, Real Quick: The story of M-PESA", The Guardian books, 2012

M-PESA partners with over 600 institutions today, which accept M-PESA payments such as M-KESHO and are helping reshaping and boost the economy. As Mugo Kibati, head of Kenya Vision 2030 campaign describes "M-PESA has turned phones into SME Offices" by unleashing the mobile phone's economic potential and acting as a platform for other services to build onto. Services as M-KESHO are reshaping the structure of the economy of Kenya. Since 2007, the amount of currency outside banks is declining and as M-PESA has made remittances cheaper, people are sending more money. It not only changes the economy, it also changes lives as Olga Morawczynski concludes in her study "Surviving in the 'dual system': How M-PESA is fostering urban-to-rural remittances in a Kenyan Slum", although it is too soon to say if M-PESA really fosters development, what can "be said at this point is that M-PESA is making life a bit easier for many in Kibera."[100] Kibera is Nairobi's biggest slum.

M-PESA acted as an eye opener in Kenya for other sectors than finance, demonstrating the potential a mobile phone when combined with an adequate strategy tailored to local needs, to be more than just a means of communication. Products like Tone Kwa Tone Pata Pump illustrates the inventiveness and the possibilities that mobile can bring in the sector of agriculture, which this paper will further develop. The three sectors of health, education and agriculture are essential to Africa's growth and the following case studies, based in Kenya, will show how.

B. Mobile-agriculture: Improving agricultural sector's productivity

1. Making a case for m-agriculture

In Kenya, 79 per cent of the population lives in rural areas, relying on agriculture for most of its income and 70 per cent of the country's GDP comes from agriculture. In 2008, only 7 per cent of rural households possessed a telephone and 40 per cent on average were out of reach of a cellular network[101]. Today, rural teledensity – the number of phones in use for every 100 individuals living within an area – is rapidly growing as mobile networks are opening their offer to rural customers.[102]

[100]Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf p 124
[101] Annie Chéneau-Loquay, French Ministry of Foreign and European Affairs and the International Telecommunication Union Report on "Innovative ways of appropriating mobile telephony in Africa", 2010 p12
[102] GSMA Development Fund, M-Agriculture Programme: http://www.gsma.com/developmentfund/programmes/magri/resources/

Rural areas and the agricultural sector have an unexploited potential that the mobile phone could help exploit, considering that rural areas are the least connected to the grid and that the agriculture sector's productivity is very low. This can be explained by a lack of access to input and credit, a lack of information and skills, a lack of funding and a lack of coordination of the supply chain.[103] As a result, inasmuch as they are comparable, crop yields in developing countries are almost 80 per cent lower than those in developed markets.[104]As Business Monitor International underlines in its assessment of the latest Kenya Telecommunications Report "rural expansion [of mobile networks] is vital for sustainable subscriber growth in the medium term".

The mobile phone presents a double opportunity. It is an opportunity for MNOs to grow their subscriber base reaching into rural areas, an expansion considered as vital by Kenya's latest Telecommunication report. [105] It also acts as a platform where farmers receive useful information, advice and even insurance for their produce which would allow them to increase their productivity. M-agriculture thus defines "the delivery of agriculture-related services via mobile communications technology."[106]

Interviewing Natalia Pshenichnaya, mAgri Business Development Manager at the GSM Association sheds light on the m-agriculture's business. Her role is broadly to create fertile grounds for m-agriculture services to develop, become sustainable and scale up. In order to do so, on the one hand, GSMA pushes MNOs in the m-agri space, for them to realise the potential and the value-added of m-agri services. On the other hand, the association assesses the farming needs in order to understand what is the information most worthy to give out and which service will do it the most efficiently. Connecting those two ends will create the grounds for producing efficient VAS, which will bring social and economic value added to farmers, who will then see the benefits of paying for these services.

The M-Farmer Initiative was thus launched in 2011 as part of GSMA's m-Agri framework and will begin its second phase in the fall. It is being set up "to support mobile service providers, in partnership with public and private sector agriculture organisations, to utilise the

[103] Fritz Brugger, "Mobile Applications in Agriculture", Syngenta Foundation, 2011 p 4
[104] GSMA Development Fund, M-Agriculture Programme:
http://www.gsma.com/developmentfund/programmes/magri/resources/
[105] Kenya Telecommunications Report Q2 2012, Business Monitor International, 6 March 2012 :
http://www.marketresearch.com/Business-Monitor-International-v304/Kenya-Telecommunications-Q2-6844273/
[106] Fritz Brugger, " Mobile Applications in Agriculture ", Syngenta Foundation, 2011 p 4

mobile channel to extend the reach and improve the quality of information and advisor services for small-holder farmers in emerging markets."[107] Its goal is to help reach two million households by 2015, improving their resilience and decision making, thanks to delivery of information via mobile phones.[108] It is also to drive sustainable, scalable and replicable business models.

There is still some convincing to do, as Natalia Pshenichnaya observed, in order to demonstrate to MNOs that the mobile phone can improve efficiency thanks to the delivery of "actionable, timely and relevant information to small-holder farmers"[109] and transform the sector. M-agriculture VAS are still at a very early stage and will need MNOs' investments before it can scale up. However, the ground is being set. In line with GSMA's efforts, the Kenyan government is encouraging network expansion in rural areas and has reduced spectrum fees by an average of 41% in October 2011. At the international level, support to Agriculture is also a priority, as the United States announced a multi-billion dollar investment for African agriculture at the 2012 G8 Summit. The role of the mobile phone in agriculture has been recognized as a particularly important model for people living in remote and rural areas with poor access to goods and services. The positive results of agricultural services using mobile phones in Kenya are a proof of their potential.

2. Case studies: M-Farm, Kilimo Salama and AgriManagr

M-Farm, Kilimo Salama and AgriManagr are three of many m-agriculture services that are being deployed in Kenya, a country that is proving very fertile for VAS. As noted previously, these value added services serve primarily small-scale enterprises or individuals, which constitute the majority of the agricultural landscape and need these services the most.

M-Farm: "Connecting farmers"

Susan Oguya presents the profile of a successful Kenyan women IT entrepreneur. She co-founded M-Farm with Jamila Abbas whom she met while interning at the iHub.[110]

[107] GSMA Development Fund, M-Agriculture Programme: http://www.gsma.com/developmentfund/programmes/magri/resources/
[108] Idem
[109] Idem
[110] Jamila Abass, also created in partnership with Susan Oguya the organization Akirachix

Together, they came up with a service which would use technology to empower farmers. They decided to tackle a factor of market inefficiency and of great unfairness: the exploitative behaviour of the trader, the middleman. On the seller's end, the service provides daily local and regional market crops prices – while the government only provides weekly updates – via SMS, which enables farmers to sell their produce at the right price, as they can compare the different market prices. It thus eliminates the role of the middleman, who could previously set arbitrary prices the farmer would not be able to check. In addition to price information, farmers are provided with weather alerts to better manage their crops. On the buyer's end, M-Farm works with agents who buy the produce directly from the farmer, guaranteeing, for the farmer, a reliable market with stable prices and, for the buyer, a more efficient supply chain. The agent also acts as an intermediary for farmers to sell in groups, in order to access bigger markets, have collective buying discounts and lower input costs. "The whole process is to get the information to flow using mobile technology" says Susan Oguya. More communication and information makes for a more efficient production chain as coordination is improved thanks to M-Farm agents.

M-Farm is growing and making the agriculture sector more attractive. From 73 farmers to 5,000 today, in addition to their network of NGOs which gives them access to more than 10,000 farmers. During the pilot phase, farmers saw a 50 per cent increase in their profits and 30 per cent saving on the cost of input.[111] Farming is thus changing from a "poor-man's job" to a more time-critical and information-intense business, although Susan Oguya suggests that this shift is relatively new and M-Farm is working on making the sector "sexier" for the young as well as valuable for the old.

Another interesting challenge, common to any projects working with local agents as intermediaries, is the need to expand funds as the project grows. A study from the consultancy Hystra highlights that value added services accessed through local agents might not require high initial investment, as they are able to overcome – to a certain extent – technology ownership and literacy issues, which also allows them to reach deeper in the "Base of the Pyramid". However, this model needs a sustained financing mechanism to cover costs of new

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which promotes the insertion of women in the ICT sector. Although only superficially mentioned in this paper, the question of gender and women in ICT are determinant in Africa's development. (http://akirachix.com/about.html)

[111] Interview with Jamila Abass, co-founder of M-Farm, Unreasonable Institute Fellow 2012, **http://unreasonableinstitute.org/profile/jabass/**

agents and their training, during their development phase.[112] M-Farm is funded by different investments, partners with Samsung and sells data and trend studies on agricultural prices. Their model is still changing in order to best respond to their audience's needs before they scale up and move to other markets. This will happen "once the product is well packaged for Kenya", as Susan Oguya clarifies, proving the need for a "step by step" approach. An approach Joe Mucheru, head of Google in Kenya, would agree to when he says "We need to solve the nitty-gritty first and then we can invent new things."[113]

Kilimo Salama: A weather-based micro-insurance mobile application

Value added services accessed directly by the end user such as Kilimo Salama have other advantages and constraints. Kilimo Salama is a weather-based micro-insurance m-app distributed to small-scale farmers to insure their investments in inputs—such as seeds, fertilizers, and chemicals—against weather risks such as drought or excess rainfall.[114] The farmer pays a small premium (for instance if seeds cost Ksh 180/kg, the cost with insurance will be 189/kg) and receives a confirmation of registration to the m-app by SMS, with the insurance details and policy number. At the end of the season, the farmer will receive an SMS to know whether there is a payout. If so, the customer will receive the compensation directly on the mobile phone, via M-PESA.

In addition to mobile-insurance, Kilimo Salama m-app offers a helpline for farmers, and sends SMS to help them improve their techniques as "complex interactions between weather, information flows, proper use of the information, and insurance arrangements require education and extension services."[115] Kilimo Salama m-app requires more training for farmers to learn how to efficiently use the tool, than if an agent had been acting as intermediary. It thus requires more entry-level investment but directly empowers farmers who manage their own input and have the opportunity, before inaccessible, to get inputs insured against extreme weathers.

[112] Hystra report, http://www.hystra.com/opensource/Rapport_ICT_Executive_summary.pdf Executive summary
[113] The Economist, "Upwardly mobile, Kenya's technology start-up scene is about to take off", 25 August 2012
[114] Christine Zhenwei Qiang, Siou Chew Kuek, Dymond Andrew and Esselaar Steve "Mobile Applications for Agriculture and Rural Development", ICT Sector Unit, World Bank, December 2011
[115] Idem

Kilimo Salama's mobile application improves the efficiency of the agriculture value chain and enables retail costs to go down.[116] It also allows farmers to invest into high-yield input which used to be too risky to buy as more expensive and not insured. As a result, small-scale farmers have augmented their average income of approximately USD150 and their production by 50 per cent and are increasingly using the service. Farmers who had insured 10-20 per cent of their input the first year, increased their insurance to 50 per cent the second year.

Table 3.2. Benefits of Various Mobile Applications

Application	Country	Increased income through better access to information and services	Higher-yield production	Improved efficiency in supply chain	Better access to finance
Virtual City AgriManagr	Kenya	• Typically, small farmers see their incomes increase 9% due to better measuring and recording of produce weights		• Transaction time reduced from 3 minutes to 22 seconds • Cost of delivery reduced by 75% • Fraud minimized through use of electronic data entry	
KACE	Kenya	• 75% of farmers and 60% of commodity traders report higher incomes		• Market integration (linkage efficiency) improved for two commodities—maize and beans	
Kilimo Salama	Kenya	• $150 average increase in income per small farmer	• 50% increase in production due to insurance on higher-yield inputs	• More efficient value chain leads to lower retail costs	• Farmers in first year insured 10-20% of their inputs and increased insurance to 50% of inputs the next year
DrumNet	Kenya	• Farmer incomes rose by an average of 32%		• Improved access to agricultural inputs • Input suppliers achieve economies of scale	• Bank creditworthiness increased due to secure produce supply contracts • Reduced transaction costs

AgriManagr: a remote data collection application

AgriManagr is an m-application developed by the Kenyan IT company Virtual City, which creates innovative mobility solutions in order to use "technology not just as a communication tool but in the running of normal day to day activities".[117] AgriManagr offers an agro-management solution used to help reduce turn-around time between the collection of agro-produce and payments. In Kenya, AgriManagr has been used in the tea industry to improve and automate the supply chain. The m-application automates purchases between the leading chain of tea factories, the Kenya Tea Production Authority (KTDA), tea growers, and transport companies and provides an accurate method of collecting and recording tea leaves from the small-scale farmers at the field level.

Every tea grower goes to a collection point, where the input is weighed and the data is sent via Bluetooth to a buying centre of the KTDA. Once all the tea growers input collected, it is then physically sent and counted at the centre. All the data is registered on a personal digital

[116] Idem
[117] VirtualCity website: http://www.virtualcity.co.ke/?page_id=811

assistant (PDA) – a type of mobile device to manage information. Finally, all the tea leaves collected from the different buying centres are sent to the factory, which will also receive the digital data to ensure how much exact input has been received. The system creates reports capturing each step of the process and the weights of each individual tea growers' inputs. All the data can be viewed on a computer. Tea growers also get a record of their daily transactions.

This avoids any editing mistake and lets the tea grower know which quantity of tea they delivered on a daily and monthly basis, which reduces any fraud on either party. The automation of the supply chain has produced many positive results for the farmers and the tea factories. Farmers have increased their income by about 9 per cent, while tea factories have increased their efficiency as the average transaction time at tea buying centres has been cut from 3 minutes under the manual system to 22 seconds. Moreover, the system considerably reduced collecting costs as well as administrative costs – the cost of fraud, the annual cost for paper and the price of data entry reconciliation is estimated at 60 million Kshs (USD600,000).

These three case studies are a sample of innovative mobile solutions that are being designed for the agriculture sector and there are many more, such as the Tone Kwa Tone Pump project mentioned earlier or the iCow app, which uses SMS to track a cow's gestation cycle and give farmers notifications at key moments of the cow's life.[118] These VAS transform the mobile phone into a development tool as it is no longer only used as a mere communication tool but also as an information tool, providing useful locally relevant data. M-agri projects provide an affordable way for people in underserved areas to access information, advice, markets and governance systems previously unavailable to them.[119] They have for main objective to improve the agriculture supply chain, which produces socio-economic benefits such as the creation of new jobs (agents, for instance), the reduction of product losses and costs and the increase of farmers' income. They make the agriculture business all together more productive, more competitive and more attractive for investments.

C. Mobile-health: primary, preventive and "self-empowered" healthcare

[118] Lucas Oleniuk and Tim Alamenciak, "How the developing world is using cellphone technology to change lives", Toronto Star Newspaper, 24 March 2012

[119] Christine Zhenwei Qiang, Siou Chew Kuek, Dymond Andrew and Esselaar Steve "Mobile Applications for Agriculture and Rural Development", ICT Sector Unit, World Bank, December 2011

1. Mobile health: Giving access to health to the BOP

Health issues present arguably the most significant barrier to sustainable development[120] as being healthy is a pre-requisite to being able to live, work and socialise. Africa presents big challenges in the healthcare sector. Epidemics and the spread of infectious diseases are recurrent problems in Africa, undermining the continent's stability. Some figures presented at the e-Health Conference 2012, hosted in Kenya, illustrate the current reality: African women still face more than 100 times the risk of maternal mortality than do women in the developed world, 1 in 6 children born in the region today will die before the age of five and more than half of the population in sub-Saharan Africa still has limited access to modern health facilities.[121] As healthcare is often reserved to the wealthy and urban population, it is mostly the people at the base of the pyramid (BOP) which suffer from this situation.

Against this background, mobile health (m-health) presents a huge opportunity as it uses affordable and widely accessible mobile technology to tackle some of healthcare challenges such as "access, quality, affordability, matching of resources, and behavioural norms [through] the exchange of information."[122] A survey conducted in Kenya identified the information needs of a part of the population located in the Rift Valley, these are, by order of importance: family planning/gynaecology, followed by tropical diseases, HIV/AIDS, respiratory illnesses, cancer, sexually transmitted infections, snake bites, water bone disease, diet/nutrition, diabetes; dentistry and fits come last. [123] To those needs, health and ICT entrepreneurs are trying to answer by creating innovative mobile applications which give access to health-related information, help track and diagnose diseases and offer medical training for health workers. [124] The information m-health services provide often focuses on primary, preventive and "self-empowered" healthcare.

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[120] Vital Wave Consulting, "mHealth for Development: The Opportunity of Mobile Technology for Healthcare in the Developing World." commissioned by the United Nations Foundation and Vodafone Foundation Technology Partnership

[121] Anadach Group LLC, "e-Health Africa Conference: Integrating m-Health into e-Health Strategy Implementation" : http://www.anadach.com/e-Health_Africa_Conference_2012.htm

[122] Nicolas Friederici, Carol Hullin and Masatake Yamaichi, "M-Health" The World Bank, "Maximizing Mobile", Report published following the 2012 Information and Communication for Development conference , July 2012 p 45

[123] A.K. Wafula-Kwake and Dennis N. Ocholla, "The feasibility of ICT diffusion amongst African rural women: a case study of South Africa and Kenya", African Information Ethics in the context of the global Information Society, Vol. 7 (09/2007), International Review of Information Ethics, p.36

[124] Vital Wave Consulting, "mHealth for Development: The Opportunity of Mobile Technology for Healthcare in the Developing World." commissioned by the United Nations Foundation and Vodafone Foundation Technology Partnership

M-health apps are the most used VAS today and have a tremendous potential to improve the socio-economic growth of African countries. The same survey shows that 20 per cent of the interviewees used ICT to access health, versus 7 per cent for agriculture.[125] The apps are most often SMS or voice-based and are used to raise health awareness on diseases and epidemics, such as HIV/AIDS or polio, to remind patients to take a medical treatment or to talk them through their medical treatment. In return, it allows patients to anonymously ask questions which would otherwise embarrass them such as those on sexual matters.

These solutions are life saving when considered that some people live very far away from any hospital or doctor and do not have the time or the money to make the trip nor pay for the healthcare services. The m-heath sector thus has a tremendous potential to improve the socio-economic wealth of African countries and in terms of economic benefits, the e-health conference 2012 estimated that "opportunities in the global mobile healthcare market were worth around USD60 billion in 2010 and growing."

M-health is only beginning to develop and as Estelle Verdier –Watine, Business Market & e-health Product Manager at Telkom Kenya – Orange, explains there has been a lot of awareness raising with regards to the opportunities m-health offers but the conception of comprehensive and scalable business models takes time. There is a need for strong partnerships and MNOs are cautious of partnering with projects they are unsure will be able to scale-up. The difficulty is that most projects are in pilot phase and start very small, which makes investments risky for mobile operators.

As the Hystra report put it: "Market-based solutions in ICT4D are a high risk, high return game."[126] This said, an increasing number of early stage investors are present on the stage and MNOs are progressively being pushed in providing the technology for health services to develop. Telkom Kenya – Orange for instance is working with two projects. The first one is mobile-based, mPedigree, and the second is a voice-based medical helpline. As suggested earlier, mixing communication tools enables to target a wider audience. As Estelle Verdier-

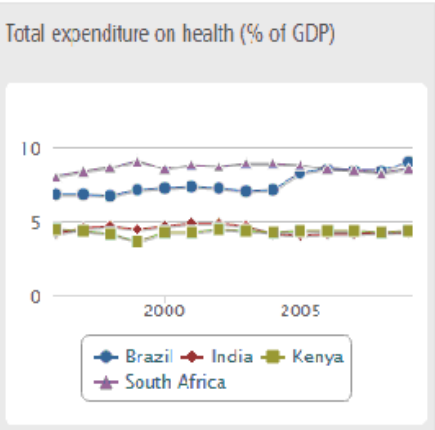
[125] A.K. Wafula-Kwake and Dennis N. Ocholla, "The feasibility of ICT diffusion amongst African rural women: a case study of South Africa and Kenya", African Information Ethics in the context of the global Information Society, Vol. 7 (09/2007), International Review of Information Ethics, p.36

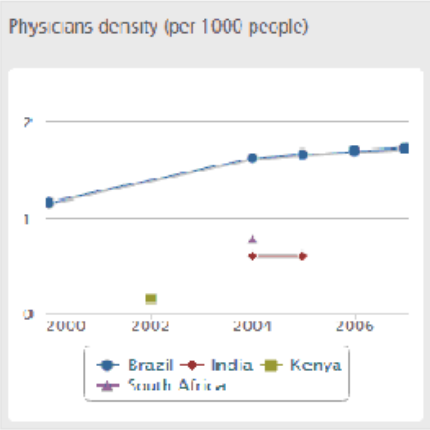
[126] Hystra Report, "Leveraging Information and Communication, Technology for the Base of the Pyramid. Innovative business models in education, health, agriculture and financial services", Executive Summary. : http://www.hystra.com/opensource/Rapport_ICT_Executive_summary.pdf

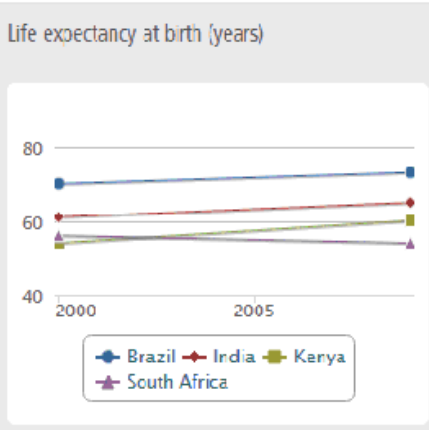
Watine underlines, MNOs do not try to replace health staff, only to provide them with platform to communicate and inform their patients. Indeed, clearly defining each actor's role is important to avoid any confusion and overlapping of competence.

2. Case studies: mPedigree, Episurveyor and MedAfrica

In Kenya, health services are severely lacking as there are only 7,000 doctors for 40 million people (see middle graph below). It is one of the first countries of Africa to try to solve health challenges by implementing "an e-Health strategy with a vision that focuses on developing efficient, accessible, equitable, secure, and consumer friendly healthcare services enabled by ICT"[127]. In 2011, the Kenyan Ministry of Information launched a first mobile health service to extend medical services via the use of the mobile phone.







mPedigree Network: a tool against counterfeit drugs

mPedigree Network is a successful non-profit mobile health platform, launched in Ghana in 2007, which uses mobile technology to fight counterfeit medical products. Its vision is "to empower African patients and consumers to protect themselves from the fatal effects of pharmaceutical counterfeiting, which kills nearly a million people a year, and maim countless more, in vulnerable parts of the world."[128]

[127] Anadach Group LLC, "e-Health Africa Conference: Integrating m-Health into e-Health Strategy Implementation" : http://www.anadach.com/e-Health_Africa_Conference_2012.htm
[128] mPedigree website : http://mpedigree.net

The way it works is simple, the consumer needs to send by SMS the barcode (scratching off a coating on the packaging[129]) of the drug he/she wants to buy to mPedigree's free number and will receive an answer as to whether the drug is counterfeit or genuine. The mobile platform "allows all patients and consumers - regardless of educational background, income or status - to instantly verify the safety and efficacy of their medicines using their own or a shared mobile phone at no cost across the 95% of territory where a mobile signal is available."[130] It is thus an efficient way to both provide health benefits by combating a very dangerous market and recover the losses of legitimate pharmaceutical companies by tracking drugs and collecting data on counterfeit drugs. It is estimated that counterfeit drugs represent about 10 per cent of the global drug market, which is equivalent to a loss of USD200 million a day.

Within five years, mPedigree has grown its partnerships with the leading pharmaceutical companies, the principal telecom operators, over five hundred technology companies and other social, political and economic stakeholders such as TED, Ashoka and the WEF. It has proved a successful and sustainable model extending its service from Ghana to Nigeria and, in 2011, to Kenya. MPedigree continues to grow and create new partnerships between drug manufacturers, marketers, pharmacists and regulators in order to make the marketplace safer. [131]

As an African social enterprise, mPedigree represents the dynamic ecosystem of Africa's ICT sector answering local health needs with affordable solutions for all. As Bright Simons, the founder of mPedigree Network stresses: "Counterfeit pharmaceuticals are a big problem for developing nations, particularly in Africa. It is important that we develop an African solution to an African problem, using the resources and technologies that are widely available and easy to implement." [132]

MedAfrica: a comprehensive medical platform

MedAfrica is an astonishing "self-empowering" m-health application by Shimba Technologies, launched in Kenya in November 2011 and incubated at Nairobi's m:lab. This m-app is Internet-based, so it is understood that it will not reach as many people as other m-

[129] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf
[130] mPedigree website : http://mpedigree.net
[131] mPedigree website : http://mpedigree.net
[132] mPedigree website : http://mpedigree.net

apps based on SMS or voice. However, it does give a glance into the possibilities of Internet-app, paving the way to mobile's future. The application integrates symptom checkers, first-aid information, doctor and hospital directories, and alert services into one single mobile information platform as shown below:

The patient can connect to MedAfrica mobile platform for many services. For instance if he/she discovers an anomaly on his/her body, he/she can check the "symptoms" widget to find, out of the different options suggested, what the anomaly could be. In addition to the information provided on each possible anomaly, the names of accredited specialist doctors are listed. If a patient wants to find a doctor – doctors are not allowed to advertise in Kenya, which makes them difficult to find – he/she can check the "doctors" widget to find a list of certified doctors with their specialities and curriculum, and call them directly.

Within a year, MedAfrica (initially called MedKenya app) went from a small-scale project to a full-fledge service and won m:Lab's Pivot 25 prize. The platform overcame m-apps' main obstacle: developing a viable business model, adapted to Africa and its relatively scarce resources on the demand and supply side. It also surpassed other major obstacles specific to m-health's such as security concerns, given that doctors listed in MedAfrica app are accredited and checked by health authorities. Moreover, the service impedes any fraudulent behaviour from doctors possibly pretending to be specialists which they are not. MedAfrica provides a real value added that makes it worth paying for and thus sustainable; the founders of this application, Mbugua Njihia and Steve Mutinda, envisaged the app to be on 200 mobile devices and generate USD2 billion in the next five years, during a pitch at DEMO (the start-up pitching event in the Silicon Valley).[133]

[133]MedAfrica by Shimba Technologies, http://www.youtube.com/watch?v=Ts6Gn-KQgnk&feature=player_embedded

EpiSurveyor: An open-source mobile data collection system to track diseases

EpiSurveyor provides another kind of mobile platform as it collects data and creates surveys. EpiSurveyor was developed by the social enterprise DataDyne in Kenya, and is now used worldwide, with 9,000 customers in 170 countries, collecting data in health but also other sectors. As the two other m-health app studied, the business model has proven scalable and is now funded entirely by its paying users. EpiSurveyor's website attributes it success to mobile technology as m-apps offer the "broad benefit of real-time transfer of data and the removal of manual data entry."[134]

The software has been designed to be accessible to all (although as FrontlineSMS it is mostly used by organisations) as it does not require high-technical skills and works on low-specification mobile phones. It offers a free version, as well as a paid premium one. Any user can download the mobile application, for free or for a premium fee, create an account and start designing forms (survey format) in order to collect data on a specific subject. The surveys once conceived, can be downloaded to the mobile phones and as recipients answer, EpiSurveyor will collect the data. Once the data is collected, it is sent to a remote server where it can be viewed and downloaded from a computer with internet access.

In Kenya, EpiSurveyor has been used to report on and monitor the results of nationwide, twice yearly children's health campaigns against polio run by the Ministry of Health and UNICEF[135]: the Global Polio Eradication Initiative. In 2007, the software proved very effective again the spread of polio, when Somali refugees fled political unrest in their country and came to Kenya. The Kenya Expanded Program on Immunization (KEPI) used EpiSurveyor, to stop the epidemic. The app tracked the path of the virus as it entered the country and recorded those who came into contact with infected refugees. Around two million children were vaccinated in the infected or propitious to infection areas. By immunizing the surrounding areas, the spread of the polio virus could not go any further.

As explained in the UN Foundation / Vodafone Foundation report on m-health, prior to EpiSurveyor, health staff had to collect data on paper, and final analysis had to wait for

[134] EpiSurveyor Website, Global Polio Eradication Initiative : http://healthmarketinnovations.org/program/global-polio-eradication-initiative-gpei

[135] The United Nations Foundation and Vodafone Foundation, Vital Wave Consulting "mHealth for Development, The Opportunity of Mobile Technology for Healthcare in the Developing World", July 2009 p 32

thousands of data points from hundreds of individual paper surveys to be entered electronically, not to mention the possible margin for mistakes during editing. The software is making collecting data, even in very difficult areas, possible. For example, the NGO Internews used EpiSurveyor to conduct surveys on in the Dadaab refugee camp of Northern Kenya. The NGO wanted to understand what information people in the camp needed most and how they wanted to receive it in order to improve their daily life and enable them to get organised in a better fashion. Using smartphones and EpiSurveyor's techniques, the NGO managed to increase efficiency of data collection and hasten response time.[136]

These three case studies built viable business models and have scaled-up, but today this situation represents the exception rather than the rule in the m-health sector. They are many more brilliant pilot programs that have not yet fully developed; to name a few Jacaranda Health and Access Afya are two Kenyan pilot projects that focus on maternal health. As described by Allison Ettenger, fellow at Jacaranda Health, the pilot is currently using CommCare (a health-data gathering mobile and web platform) to collect data at their mobile outpatient clinics, which are spread across low-income neighbourhoods. These clinics focus on antenatal and postnatal care and are there to safely keep clinical records of their patients and stay connected with them via SMS (for postnatal care). Melissa Menke, co-founder and CEO of Access Afya described the work of their high-tech paperless clinic. Access Afya uses e-Health systems to monitor patient information, inventory and referrals. The clinic uses m-health more specifically for maternal health messages, to communicate with youth and follow-up with every patient.

If the m-health landscape is still being outlined, these case studies show mobile phones' vast potential to improve the efficiency of health services in developing countries, such as Kenya, and how they impact positively socio-economic development. A Telenor Group study estimated in 2012 that m-health will reduce data collection costs by approximately 24 per cent, cost of elderly care by 25 per cent and maternal and prenatal mortality by 30 per cent.[137] M-health application originated in developed countries but the examples of mPedigree or MedAfrica reflect a new dynamism, where IT entrepreneurs are creating African innovations, tailored to their markets.

[136] Dadaab, Kenya - Digital Survey Captures Refugees' Information Needs, http://www.youtube.com/watch?v=plc395hH1zs

[137] The World Bank, "Maximizing Mobile", Report published following the 2012 Information and Communication for Development conference , July 2012 p 50

D. Education: mobile added services that impact social and eco growth in Kenya.

"The fundamental cure for poverty is not money but knowledge"

Sir William Arthur Lewis
Economist

1. M-education: the possibility to educate all

Education, as agriculture and health, is a determining aspect in a country's development. To eat, to be in good health and to be educated are all pre-requisites for a country to achieve socio-economic growth. In Sub-Saharan Africa, 10 million children drop out of primary school each year and the average 15-year-old is not in school.[138] To quote Thabo Mbeki, President of South Africa: "If the next century is going to be characterized as a truly African century, for social and economic progress of the African people, the century of durable peace and sustained development in Africa, then the success of this project is dependent on the success of our education systems. For nowhere in the world has development been attained without universal and sound primary education, without an effective higher education and research sector, without equality of educational opportunity."

The mobile phone can be used for two slightly different functions, in the area of education. It can be used to provide educational-related information most often to young people, m-education, and it can be used to transfer any type of specific knowledge applied to concrete issue or work project, m-training. Both usages are comprised in the larger definition of m-learning which is defined by the GSMA m-learning programme as "the ability to access educational resources, tools and materials at any time from anywhere, using the mobile device".[139]

M-learning value added services provide equity and equality as the mobile phone's ubiquity and affordability eliminate most "barriers to large scale adoption of learning platforms to achieve knowledge transfer".[140] Both those attending school and those who do not, can access

[138] The e-learning Africa 2012 Report, Sponsored by WYSE. : http://www.elearning-africa.com/pdf/report/ela_report_2012.pdf p 8

[139] GSMA Development Fund, "M-Learning: A platform for educational opportunities at the base of the pyramid", November 2010. : http://www.gsma.com/developmentfund/wp-content/uploads/2012/04/mlearningaplatformforeducationalopportunitiesatthebaseofthepyramid.pdf

[140] Gustav Praekelt, "Mobile opportunity for learning in Africa" Educational Technology Debate, 18 July 2011: https://edutechdebate.org/affordable-technology/mobile-opportunity-for-learning-in-africa/

the same learning, unlocking "the user from a fixed infrastructure and limited distribution".[141] It is also a personal device (if not shared) that provides a very direct way of accessing educational resources, which could have been difficult to access otherwise. M-learning is gender neutral and can help reduce the educational gender gap, as women have access to the same information as men. Distance learning is also becoming possible, although still quite limited given the cost and the time it takes to prepare these classes, in addition to in-house classes. As Lauren Dawes, head of GSMA mLearning programme, sums up: "Via a small screen on an affordable device that fits into a pocket, mobile learning provides vast potential in dissemination of transformative and life enhancing information."[142]

The 2012 e-learning report provides some interesting information to understand the priorities of African countries concerning education and the application of technology to improve it. First, the report confirms that mobile phones are the best alternative to computers for educational projects, brushing away (legitimate) interrogations as to whether learning on a tiny screen is a viable option for education. The motivations for using any ICT in education are: to improve the quality of teaching, to develop 21st century competencies and to access remote areas. People and organisations will take the financial costs and the education value into account before ICT for education. Simplicity and suitability of the software are also important criteria.[143] The survey responses echo the idea that the technology must be adapted to local needs and usages.

On a larger scale, mobile learning could help increase the quality and the spread of African academic studies worldwide. A study identifies "poor education and/or lack of equipment and an inability to command English and/or French"[144] as some contributing factors to the poor quality of African academic studies. Mobile phones – if alone are not going to solve the whole problem – can work on each of those three problems: improving education, being an accessible ICT device and teaching a language (many m-education VAS work on language teaching). This situation might also explain the lack of African publications on the world stage, as they represented 1 per cent of the world's scholarly publications in 2003: "Africa is

[141] GSMA Development Fund, "M-Learning: A platform for educational opportunities at the base of the pyramid", November 2010.
[142] The e-learning Africa 2012 Report, Sponsored by WYSE. : http://www.elearning-africa.com/pdf/report/ela_report_2012.pdf
[143] Idem
[144] Johannes J. Britz, "The joy of sharing knowledge : But what if there is no knowledge to share ? A critical reflection on human capacity building in Africa", African Information Ethics in the context of the global Information Society, Vol. 7 (09/2007), International Review of Information Ethics, p 25

knowledge poor since most of its knowledge wealth is still imbedded in its people".[145] More African publications on the international stage would perhaps contribute to better international information flows. Studies reveal that information has been almost exclusively been flowing from North to South, which is probably due, at least in part, to the lack of African academic material available. If the material and the knowledge are available this trend could change, allowing knowledge transfer from the South to the North, and not only from the North to the South, and encourage "mutual understanding".[146]

2. Case studies: m-Prep and Text to Change

Education is clearly identified as priority for development in Kenya. Teachers have been said to be early adopters of ICT for education, rapidly acknowledging the benefits it could provide, and the government launched, in collaboration with its development partners, the Kenya Education Sector Support Programme (KESSP), based on the rationale of the overall policy goal of achieving Education For All (EFA) and the Government's commitment to the attainment of the Millennium Development Goals (MDGs). The broad objective is to give every Kenyan quality education and training no matter his/her background or socio-economic status, by providing an all inclusive quality education that is accessible and relevant.[147] An objective m-education and m-training can help Kenya achieve.

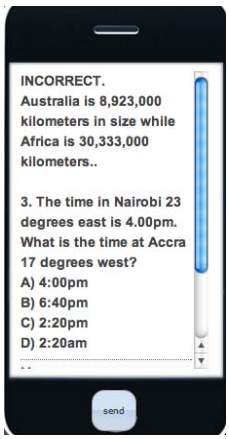
M-Prep: Preparing for exams with quizzes

M-Prep is a not-for-profit technology platform that addresses three publics: the student, the schools and the parents. Christopher Asego, M-Prep's Operations Director, was interviewed to learn more about the project and understand how concretely a young student, as this app is directed to that audience particularly, could learn from the small screen of a basic phone. M-Prep's main objective is to give students access to quality study materials, aligned with the local school content using ubiquitous mobile devices.

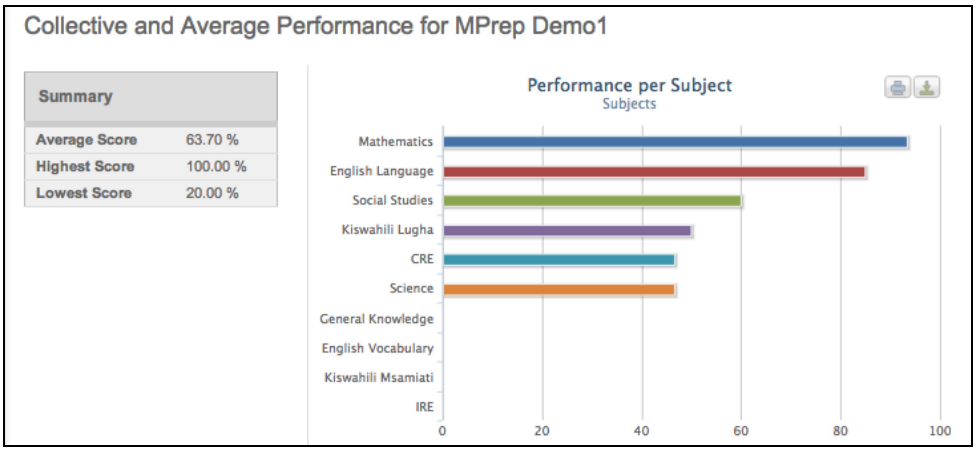
This learning platform is both SMS and internet based, so as to reach as many people as possible. The SMS is privileged as a cheap way of connecting with all students and it also

[145] Idem p 19
[146] Rafael Capurro, "Information Ethics for and from Africa", African Information Ethics in the context of the global Information Society, Vol. 7 (09/2007), International Review of Information Ethics, p.12
[147] "Accelerated Learning: New Opportunities for Children at Risk". Paper presented by Mr. Henry Kemoli Manani Ag. Deputy Director, Kenya Institute of Education. : http://info.worldbank.org/etools/docs/library/241473/MananiAcceleratedLearningNo2.pdf

gives time for them to think about the questions before answering. M-Prep offers different quizzes (mathematics, history…) which can be downloaded on the mobile phone. The student only needs to send an SMS for 20 Ksh (around USD0,20) to the platform which will then send him/her a bulk of 18 questions. As Christopher Asego specifies, the quizzes are done in collaboration with the Ministry of Education and are for children in primary school to prepare for the Kenya Certificate of Primary Education – a determinant examination for future schooling.



Since May 2012, M-Prep also gives schools access to meaningful Internet-based data about their students, by subscribing for a basic or premium fee. Schools, once subscribed, get a password and can go online to view the performances of the students. They can also view the level of students in other schools around which increases competitiveness and encourages schools to be more efficient and better manage their students. Parents can also subscribe to receive their children's data, they will view the reports online, which give them an overview per subject as seen below:



Although still a pilot project, funded by investors, grants and awards, M-Prep is already planning the next step. Its team is growing and there are developing their business model in

order to scale-up and reach as many schools as possible in Kenya. They expect that selling of their data will rapidly allow them reaching self-sustainability. Today more than 4,000 students in 84 schools across Kenya are using M-Prep to prepare for exams.[148]

One challenge Christopher Asego noted is the suspicion with which M-Prep staff members have sometimes been received by schools in rural villages. Schools are often approached by projects that eventually fall through, which explains why they are not always welcoming as they cannot afford to endorse projects that do not last. This is why sustainability is an important question and that funding only relying on Corporate Social Responsibility, Foundations or other grants and awards need to find innovative ways to become self-sustainable.

Text to Change/ Airtel Kenya: M-training

The partnership between the MNO Airtel (previously Zain) and the non-profit organisation Text To Change (TTC) focuses on delivering health information on HIV/ AIDS via mobile phones. This project differs from M-Prep's educational objective and represents the other dimension of m-Learning, which for the purpose of this paper is called "m-training".

The objective for Airtel is to raise awareness among its employees on the virus through SMS mobile quizzes. TTC is a successful NGO that has been finding new ways to deliver information, often life changing, and believes that "adequate knowledge and information is vital to encourage behavioural change."[149] Hajo van Beijma, Partnership director of TTC advised: "The mobile phone has challenged the regular way of disseminating healthcare information, because of its omnipresence, bottom-up, growth and usability."[150] The mobile phone has a particularly big impact on awareness raising in the health sector as most mobile VAS are focused on delivering health data (34 per cent of mLearning programmes involving MNOs) followed by teaching languages (11 per cent) while literacy only accounts for a small portion (6 per cent) of mLearning programmes. [151]

[148] Magazine Soma Tanzania,"Kenyan students use mobile service for exam prep", 25 June 2012 : http://somatanzania.org/kenyan-students-use-mobile-service-for-exam-prep/
[149] http://www.texttochange.org/
[150] GSMA Development Fund, "M-Learning: A platform for educational opportunities at the base of the pyramid", November 2010.
[151] Idem

These different case studies reflect the usage made of the mobile device – exploited at its fullest – as well as Kenya's vibrant ICT entrepreneurial spirit. Applied to the sectors of finance, agriculture, health and education, the mobile phone can be a life changing tool as it provides useful information and knowledge to people at the base of the pyramid – i.e. the majority of the Kenyan population – who would otherwise not have access to any of this data. The mobile phone transforms alternatively into a wallet, a weather forecast, a teacher assistant, or a doctor. These case studies illustrate what the mobile revolution is about, as they develop their business models, they learn from their mistakes and assess their obstacles to best overcome them.

Mobile VAS are still at very early stage, most of them being still in their pilot phase and MNOs are still sometimes hesitating, precisely because these pilots have not yet proven scalability and sustainability. The multiplication of VAS, although proving the dynamism of the IT scene in Kenya, might also create some fragmentation of the market, such as the health, or education market. Because applying technology to development purposes is not an easy task, requiring control and a step by step approach, all stakeholders – MNOs, government authorities, civil society and IT entrepreneurs – need to be involved and have a part to play to make sure the right ecosystem is in place.

III – Challenges to M4D: Establishing the right framework

"In Africa, poor ICT infrastructure, combined with weak policy and regulatory frameworks and limited resources, has resulted in inadequate access to affordable telephones, broadcasting, computers and the Internet."

The New Partnership for Africa's Development, 2001

The overall challenge for ICT, including mobile technology, to provide socio-economic benefits lays in the establishment of an enabling, healthy and stable, political, economical and social environment. It is in an environment where human resources, physical and capital infrastructures are in place, where the ICT "hype" is tempered, and where the focus is on the people using the technology, that ICTs will maximize their potential for development.

Addressing these challenges is a work in progress which requires all stakeholders' attention and engagement. International bodies, national governments, independent regulators, the private sector and civil society are responsible for creating the right ecosystem to drive Africa's Information Society.

A. Establishing the institutional framework …

1. The role of the government: create a broad strategy and build cooperation

"Clearly, if we are to succeed, the process must engage all stakeholders: donors, the private sector, civil society organizations, governments, and especially those in the developing world itself."

Kofi Annan
Former Secretary-General of the United Nations
"Communication Technologies:
A Priority For Africa's Development", 2003

The government's role is to provide an overall strategy and an enabling environment for developmental ICT policies to take place. For this to happen, the first step is for the government to connect ICT and development strategies. In the early days of ICT4D, international and national authorities started to unveil enthusiastically the potential of ICTs for human and economic development, prioritizing the reduction of the digital divide as a solution to improve countries' growth. This approach to poverty and inequality, tackling the gap between those who have access to technology and those who do not, was seen as incorrect, and perhaps even dangerous**.** A doctor's opinion piece illustrates the criticism when discussing ICT for health: "there is no a priori reason for thinking that a reduction in the digital divide will lead to a lessening of the health divide. In fact, more digital equality could make things worse as new technologies pose threats as well as opportunities."[152]

The second part of this quote points at the idea that ICTs pose risks as following the "neo-liberal project of globalisation". Without entering into that debate, it is certain is that tackling the digital divide as a priority to promote development is addressing the problem the wrong way. The digital divide is the result and not the cause of poverty; it reflects socio-economic inequalities. The focus should therefore not be so much on reducing the technology gap but

[152] Dr. Sally Wyatt, "Bridging the health Divide, more information, better health?"

rather on tackling inequalities with effective strategies. [153] This shift puts the problem before the solution and the technology: "Putting an end to the digital gap starts with the abolition of all the gaps: social, cultural, health and employment gaps. The digital revolution is not a 'magic wand' that can solve all out complex and permanent problems."[154]

With time, the concept of ICT4D matured, stakeholders learnt from initial mistakes and readjusted their initial approach: technology should be an enabler rather than an end goal. Government policies would use ICT as a tool for development but not a priority, as Kenya's Vision 2030 illustrates. Quoting Jeffrey Sachs, Director of Columbia University's Earth Institute: "We've turned the corner on the digital divide (…) We'll find that it is in business, it's in emergency services, it's in public education, it's in primary healthcare, banking, distance learning, scientific communications, entertainment, and all the rest and this will make a very big difference."

An enabling environment for the ICT sector to grow and bring development to a critical mass of users requires more than just a developmental ICT theory. In practice, the government is also responsible for promoting fair competition and Universal Access Funds, ITC-friendly policies and stable regulatory regimes. Establishing strong and independent regulators, at the national level, help limiting pricing pressures between operators and enable governments to collaboratively exchange with the industry, civil society and the private telecom sector.[155]

"Cross-sector collaboration"[156] is a critical factor to create the right ecosystem and provides the best chance at aligning developmental and business interests. For instance, the government and telecom networks must work together to find the most efficient ways of opening up the telecom networks at affordable rates for all. This will require efforts on both parts, as on the one hand MNOs have traditionally controlled the mobile ecosystem, protecting their "walled garden"[157] by filtering the m-applications allowed in theirs systems

[153] R.W Harris, "ICT for Poverty alleviation" 2004: http://www.apdip.net/publications/iespprimers/ICTs4PovertyAlleviation.pdf
[154] Mohamed Mesbahi, "The Third World and the paradox of the digital revolution", African Information Ethics in the context of the global Information Society, Vol. 7 (09/2007), International Review of Information Ethics, p49
[155] Catherine Nyaki Adeya "ICT and Poverty : A literature review", PhD, Ottawa: Acacia Initiative, IDRC, 2002
[156] Hystra Report, "Leveraging Information and Communication, Technology for the Base Of the Pyramid. Innovative business models in education, health, agriculture and financial services", Executive Summary. : http://www.hystra.com/opensource/Rapport_ICT_Executive_summary.pdf
[157] The World Bank, "Maximizing Mobile", Report published following the 2012 Information and Communication for Development conference , July 2012 p19

and "dictating how revenues from the apps are shared".[158] On the other hand, governments charge excessive fees on MNOs which are then passed on to the consumers, who pay disproportionate amounts of their income on their mobile phones, undermining the positive economic impact of the technology.[159] Partnering with development organisations in Africa as well as with multilateral initiatives, such as the G8 DotForce and the UN Task Force, will be an additional guarantee to ensure that ICT policies are focused on poverty alleviation.

2. The example of Kenya

Kenya has been a pioneer in promoting ICT policies as an opportunity for socio-economic growth. It is therefore in advance relative to other African countries and can be taken as an example, although this paper does not suggest that this situation represents the current environment in the whole of Africa today. One of the main reasons for Kenya's successful uptake of mobile technology is its supportive government and key authorities. The Central Bank of Kenya played an important roll in allowing "regulation to follow innovation while reassuring the market."[160] The CCK regulator also agreed that mobile money agents needed only limited requirements to enter the business, as not providing banking services, and enabled M-PESA to become the success story, this paper has glanced into, since 2007. In 2009, the EASSy was put in place, thanks to the Ministry of Information and Communication Technology's efforts, making price plummet and bandwidth explode."[161]

Safaricom's position of monopoly is still a part of an unresolved puzzle, and has been again, recently, pointed out by the World Bank. Regulatory actions have already been taken in 2010 allowing subscribers to switch networks without losing their numbers but additional regulatory attention is required to promote competition and interoperability, and reduce entry barriers to the telecom market. To this demand, Safaricom's CEO, Bob Collymore answers that there is not enough demand to inter-operate and does not understand why their service that required – risky, heavy and forward-looking – investments should now be redistributed among all operators.

[158] The World Bank, "Maximizing Mobile", Report published following the 2012 Information and Communication for Development conference , July 2012, p 19
[159] Peter Kwaku Kyem, "Transforming Recent Gains in the Digital divide into Digital Opportunities: Africa and the Boom in Mobile Phone Subscription", EJISDC (2006), 28, 1-16
[160] Wolfgang Fengler, "Kenya: How Kenya Became a World Leader for Mobile Money", Capital FM Magazine, 17 July 2012
[161] The Economist, "Upwardly mobile, Kenya's technology start-up scene is about to take off", 25 August 2012

If this situation should change, it remains true that Safaricom has been providing a strong lever for Kenya's ICT ecosystem to develop. This new ecosystem is beating the drum and marking the – fast – pace of innovation. The government, if following the beat rather than preceding it, is however engaging and encouraging the adoption of ICTs in ways that make the country develop. Non profit organisations, as well as development funds, are present on the field to make sure that ICTs is indeed developed to promote the country's growth.

B. Tempering the hype

The default position for many people working in ICT4D is to build centralized solutions to local problems – things that 'integrate' and 'scale'.

With little local ownership and engagement, many of these top down approaches fail to appreciate the culture of technology and its users."

Ken Banks, founder of FrontlineSMS, January 2009.

1. Risk of falling in love with technology

During a brainstorming session at the iHub, organised by M-Prep and BriteSkills[162], on the "possible negative impact of technology on teaching", all sorts of risks and concerns were brought up: risk of technology replacing people (teachers), risk of forgetting the importance of face to face communication, risk of making work longer for the non-technologically savvy and more complicated rather than faster and easier, risk of forgetting the context in which technology is developed. In sum, the risk of falling in love with the technology and forgetting the reason why those services are created in the first place: the people and their socio-economic well being. One would almost think coming into to this "meet-up" that risks were more important than opportunities, however as the meeting went on, the subject was slightly redefined and these risks, after being listed, were considered manageable. The conversation concluded on the fact that technology was there to stay, for the better, not for the worse.

It is not only about scaling up projects; there is first a need focus on people's needs to make sure technology has a positive impact, and not the contrary, on a country's socio-economic

[162] BriteSkills is "a service that allows students and any other persons in need of learning to look for tutors offering unique lessons, reserve lessons and attend them. It brings on one platform many experts on different skills thereby enabling students to learn new skills at affordable rates. (http://www.briteskills.com/)

growth. This can at times prove challenging for the tech community especially since the mobile phone has become an increasingly affordable and available, easy-to-use and socially valorising ICT tool. Indeed, it is difficult to not be enthusiastic about the mobile phone's and the possibilities afforded by its multiple value added services, but the "hype" around the technology can blur the reality of the African context. The challenge for these ICT entrepreneurs is thus to make sure they take into account the context in which the value added services are deployed and assessing the needs of their targeted customers before finding the solutions.

If Kenya has been so successful in developing mobile value added services, taking full advantage of the mobile boom, it is because ICT entrepreneurs have understood that for their services to be bought, they would need to answer people's existent needs, providing local information at affordable prices. By integrating those criteria, innovators are making sure that they are creating a service, not only accessible to the largest part of the population but also worth paying for. As the e-learning 2012 report's survey indicated, people would invest in m-learning services only both the financial value and the educative value of the service were guaranteed. Interestingly, making sure that a service will be used and adopted by the customer naturally limits the risks of using ICT4D inadequately, or "as a justification for projects that wouldn't be justifiable any other way".[163] It thus could be argued that a mobile service aiming at achieving sustainability, will likely apply a developmental ICT model, and therefore reap socio-economic benefits.

1. The role of civil society

Because, it is not the role of the ICT community to think in development terms – although it has been suggested that ICT projects by providing sustainable models also respond to people's most urgent needs – non governmental organizations are also there to temper the hype and have an full part to play in realising an inclusive African information society. NGOs oversee and "customise" VAS for developmental purposes. They provide the balance to a market-oriented service industry and help ensure that universal service objectives are pursued by governments. [164] Moreover, they have been tailoring mobile and crowed-based

[163] R.W Harris, "ICT for Poverty alleviation" 2004: http://www.apdip.net/publications/iespprimers/ICTs4PovertyAlleviation.pdf
[164] The African Information Society Initiative, UNECA, 1996 : http://www.uneca.org/aisi/

technologies (e.g. Ushahidi) to improve governance and democracy; aspects we have not explored in this paper, with for example services monitoring social unrest, mobilising voters, disseminating election results or tracking human rights violations.

It has been questioned whether NGOs should be investing in technology devices for development purposes rather than directly in buying drugs or building schools and hospitals. Chowdhury Nuimuddin is right "poor can't eat high speed internet access", however nothing says that these two types of investments are mutually exclusive, on the contrary hand in hand they will prove more efficient in promoting growth. As suggested throughout the paper, ICTs alone will not have a great impact on development; but, if it "does not make bad development good, it does make good development better"[165], and it is important to invest in ICTs to exploit their added value. Who better than NGOs, collaborating with local business ventures, can make sure that ICTs are used in adequate ways? Again, as Valerie Amos (UN Under-Secretary-General for Humanitarian Affairs and Emergency Relief) suggests, coordination is key, between the "structured humanitarian system and the relative loosely organized volunteer and technical communities."[166]

C. Finding innovative solutions to the infrastructure gap

> *"In my company, we are all former activists become social entrepreneurs. If Steve Jobs had been African, he would have been a social entrepreneur as the only way to make things progress is to first create the infrastructure."*
>
> Bright Simmons
> Founder of m-Pedigree

This quote from Bright Simmons highlights two facts: the need for infrastructure for technology to have a chance of scaling up in Africa and the fact that social entrepreneurs are the ones doing it. Although the government has a role to play in terms of building national information and communication infrastructure that all sectors of society can benefit from,[167] it has been slow at doing so and innovative solutions are being brought forward by entrepreneurs as they have understood that they should not wait.

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[165] R.W Harris, "ICT for Poverty alleviation" 2004: http://www.apdip.net/publications/iespprimers/ICTs4PovertyAlleviation.pdf
[166] The United Nations Foundation and Vodafone Foundation, Vital Wave Consulting " mHealth for Development, The Opportunity of Mobile Technology for Healthcare in the Developing World", July 2009 p 69
[167] The African Information Society Initiative, UNECA, 1996: http://www.uneca.org/aisi/

The private sector has been leading the way, tackling some of M4D's biggest bottlenecks, finding new solutions to the lack of human resources, the lack of power and electricity infrastructure, and the financing gap.

1. Human capacity building: "It's 10 per cent technology, 90 per cent people"

"The willingness is there, the readiness is there. But until we create a critical mass of health professionals who are conversant in the technology and who have seen firsthand the benefits of this approach to data collection, it will remain an elite or pilot kind of activity".

Dr Maresha
World Health Organisation

Human capacity building, i.e. developing individuals' core skills and capacities through training and education on ICT usages, to help them achieve development goals,[168] is another critical element to insure that there is no improper leapfrogging, or cheetah-pole-vaulting, into modernity. A study, which applies Sen's capability approach to ICT,[169] determines that "enhancing people's informational capabilities is the most critical factor determining the impact of ICTs on their well-being".[170] Information capabilities transform into human and social capabilities – being literate, knowing how to speak English, being computer-literate – and thus impact positively the economic, social, organisational and political aspects of people's lives.

If a mobile phone is, in itself, fairly easy to use, some mobile value added services require training without which its benefits cannot be adequately exploited by the customer; this is especially true for VAS which do not use agents as intermediaries. As Sharon Langevin and Tosh both said it is "10 per cent technology, 90 per cent implementation and people", not the other way around.

2. The electricity gap: how mobile networks overcome the lack of physical infrastructure

[168] R.W Harris, "ICT for Poverty alleviation" 2004: http://www.apdip.net/publications/iespprimers/ICTs4PovertyAlleviation.pdf
[169] This approach uses peoples' human capabilities, rather than measures of access or usage, as its principal evaluative space.
[170] Björn – Sören Gigler, "Informational Capabilities – The Missing Link for the Impact of ICT on development", World Bank Working Paper, March 2011

To ensure that mobile phones can maximise their potential, extend their reach to as many people as possible, and help foster development not only does a country need to develop its human infrastructure, it also need to have the proper physical infrastructure to provide a constant flow of electricity and telecommunication connectivity.[171]

Electricity is essential for mobile connectivity but often lacking in Africa, especially in the most remote and rural areas. In the Middle-East-Africa region, 600 million people lack access to electricity and in Kenya, approximately 75 per cent of the population is off the electricity grid. This electricity gap presents a main obstacle to the usage of the mobile phone and its various value added services. Without the power to recharge the device, it all of a sudden becomes a useless piece of plastics and electronics.

At a local level, solutions have been found to enable mobile phone users to charge their phones and a multitude of small vendor shops now offer charging services, in addition to selling pre-paid cards or airtime, which most often involve using a generator or a solar power collector.[172] The mobile phone can also be recharged with a car battery or any diesel battery. These solutions are ingenious and overcome the absence of electricity but are individual initiatives, which would have more impact if scaled-up to reach a wider part of the off-grid population, in the long run.

Charging station in a village in Bong Mines, Liberia (© Julie Thiery)

[171] H.P.P Lötter, « Are ICTs prerequisites for the eradication of poverty ? », p 290
[172] African Information Ethics in the context of the global Information Society, Vol. 7 (09/2007), International Review of Information Ethics p 290

In 2010, the GSM Association launched the Community Power from Mobile (CPM) programme, to find a scalable solution to the electricity gap in rural and off-grid communities through mobile networks. As Charlotte Ward, CPM Programme Manager based in Nairobi, explained, the initiative was designed after realising that off-the-grid areas often had mobile base stations (BTS) in their surroundings. As mobile penetration boomed, mobile phones progressively outpaced the growth of the electricity grid. Indeed, in their push to reach more customers, MNOs started to generate their own off-grid power in areas that did not have any other electricity infrastructure, building the quite challenging "last mile infrastructure" (base stations and agent networks).[173] It is estimated that by 2015, Sub-Saharan Africa will have more people with mobile network access than with access to electricity at home.[174] The GSMA thus identified a huge opportunity to leverage mobile technology and infrastructure to give access to rural energy service to people in remote and off the grid areas.

MNOs are in the best position to take advantage of this un-met demand for electricity, as "a mobile customer is also an energy customer and without affordable energy cannot participate in the mobile economy."[175] The off-grid energy market is valued at USD400 million (including lighting, cooking, charcoal, kerosene) and the average revenue per user (ARPU) is of USD4 a month, of which up to 40 per cent is spent on charging – money that could be spent on airtime instead. The opportunity is all the more interesting as MNOs' extensive networks of agents selling airtime and handsets could be leveraged to also charge mobile phones and other batteries. This will not only impact positively the telecoms' own business but also that of the community which will be able to spend more time communicating by mobile phone and using the various business oriented value added services.

The CPM programme does more than just provide energy for charging mobile phones, its impact is much broader as it enables to use power from the mobile power stations to light houses, stoves, energise fridges and so on. This paper will focus on CPM's impact on the use of mobile phone. A GSMA's impact analysis has already assessed that revenues per users can increase up to 50 per cent thanks to the availability of charging services. To illustrate the impact of having access to phones in villages, Charlotte Ward recalled a very short story she

[173] Charlotte Ward and Mary Roach, "Harnessing the Full Potential of Mobile for Off-Grid Energy", GSMA Community Power from Mobile, December 2011
[174] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf p 11
[175] Charlotte Ward and Mary Roach, "Harnessing the Full Potential of Mobile for Off-Grid Energy", GSMA Community Power from Mobile, December 2011

experienced in Samburu (Kenya's Rift Valley Province).There the son of the chief was setting up a security service and spent most of his money calling securities guards. If he could phone his staff more often, his business would be more efficiently, he would increase his revenues and be able to have more guards.

In Kenya, CPM has proven quite successful in finding a way to improve delivery of electricity to remote villages through mobile networks. Safaricom embarked on its first CPM project as part of its Corporate Social Responsibility programme following demands for a better electricity infrastructure by the rural communities. The mobile operator decided to use mobile towers' excess power to provide "electrical connections and ongoing power support for infrastructure"[176] already in place. These towers are powered with renewable hybrid of solar, wind or/and diesel energies, provide electricity to computers, water pumps, hospital and street lighting and work for eight hours a day. Safaricom has currently 115 base stations running on hybrid power and expect to have 200 by 2014; most BTSs have, or will have, mobile charging booths. The operator also purchased new infrastructure, such as lighting for hospitals and streets.

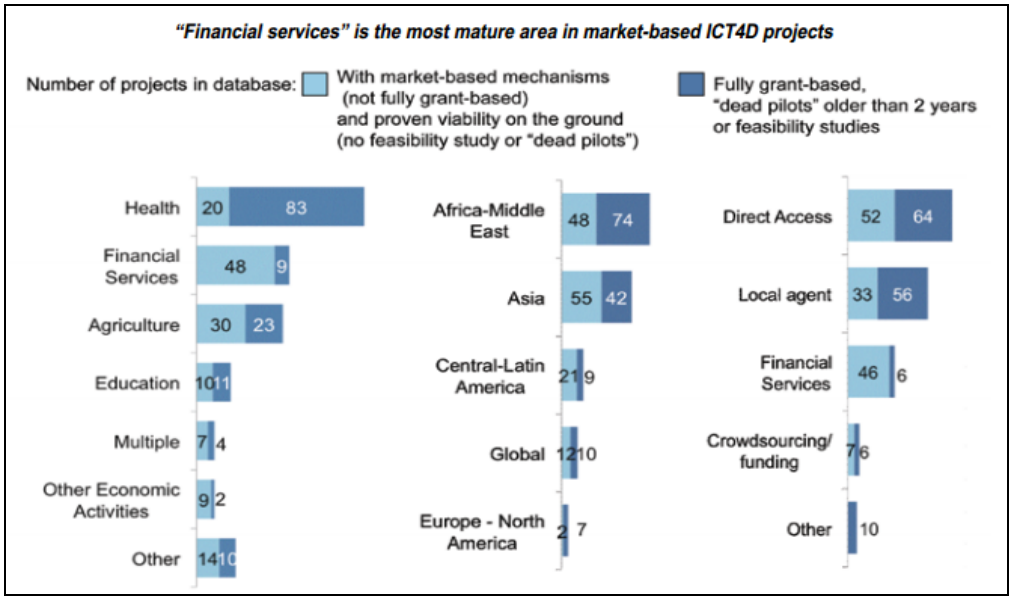
Safaricom, is today supporting over thirty CPM sites and has provided a solution to the electricity gap in remote rural areas by using excess power, enabling people to use their mobile phones and their VAS more often. The sites' infrastructure is entirely handed down to the community, which makes for better maintenance and reduced diesel theft by the community but also creates jobs as community volunteers are appointed to operate the booths. These volunteers have grown a good business as they charge 10-20 Ksh (USD 0.10 -0.20) per phone charge in exchange for guarding the booths.

Community Power from Mobile is still a very new idea and Kenyan MNOs are only slowly opening up to its different solutions, which not only involve using excess power from base stations but can also involve working with third party energy services which provide both the base station and the community with power – a model that appears as more sustainable in the long term. This last model is in trial in a few countries and in Kenya, M-KOPA has recently been launched, selling rechargeable batteries and solar home systems through the distribution network.

[176] Charlotte Ward and Mary Roach, "Harnessing the Full Potential of Mobile for Off-Grid Energy", GSMA Community Power from Mobile, December 2011

3. Finding innovative solutions to the financing gap

The lack of capital and investment for start-up content service providers is another major bottleneck[177] to mobile technology's development. Most mobile pilot projects today are funded by grants, CSR, donations and awards. Although often a good and necessary basis to begin, especially when investments are difficult to find, project must find ways to make profit and be self-sustainable in the medium-long run. Moreover, as Paul Kukubo, Head of Kenya's ICT board suggest, "if we continue to make the sector grant-dependent, we will stop entrepreneurs."[178]A paper assessing over 200 agricultural and rural development mobile applications underlines that funding (grants, CSR…) represent 85 per cent of the start-up and operating costs and that only 16 per cent of these m-apps attained sustainability after successful pilots.[179] Looking at the graph below illustrates the success and failures of m-apps to go commercial. Financial services mobile apps have proven the best viability, followed by m-agri applications. M-health and m-education applications are still behind for now:



Finding a sustainable source of money to fund pilot projects is a necessary condition for a service to scale, especially in its development phase, also metaphorically called "the valley of death". During this period, small-scale companies face the challenge of serving very local

[177] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf p 53
[178] The Economist, "Upwardly mobile, Kenya's technology start-up scene is about to take off", 25 August 2012
[179] Christine Zhenwei Qiang, Siou Chew Kuek, Andrew Dymond and Steve Esselaar, "Mobile Applicaions for Agriculture and Rural Development", ICT Sector Unit, World Bank, December 2011 p v

needs while at the same time scaling up their project to create a viable business model. This results in riskier investments which do not necessarily receive attention from the traditional funders. Erik Hersman, founder of the iHub, explains the situation in those words: "African governments aren't fast and savvy enough to build the infrastructure needed to support this type of entrepreneurial tech activity. Academic institutions are woefully behind in teaching skills for computer science and design. So when start ups and entrepreneurs have an idea, want to find partners and connect to capital and businesses, they go to incubators and tech hubs".[180]

ICT entrepreneurs are thus trying to overcome the financing gap by finding inventive funding solutions. Projects like M-Prep, M-Farm, the iHub and its Research Lab have developed creative combinations of revenue streams (memberships, SMS fee, subscriptions to data collection, consultancy and expertise services) to yield a return on investment and cover operating costs "while taking into account the services affordability"[181]. As Tosh, iHub's community manager, explained, it is now engrained in tech entrepreneurs' minds that they should find self-sustainable and profitable business models, moving away from aid, in order to scale up and produce viable services.

Mind sets are thus changing and creating fertile grounds for more productive and efficient business models, which in turn have encouraged economic growth and more investment. Indeed, thanks to this new ICT entrepreneurial landscape, private companies have been increasingly interested in investing in telecom projects in Africa. Between 2000 and 2008, USD59 billion were invested in African telecom projects. This virtuous circle is re-dynamising the whole industry and it is estimated that by 2015, investment in telecom infrastructure will grow from USD355 (2009) to USD1.5 billion.[182]

As the private sector is not the only player in the game, other solutions have been thought of to enable the mobile services market to grow. Development funds for m-apps, supported by m-labs, are one solution as Kenyan m:lab's (funded by the World Bank and Nokia) illustrates. The country is now becoming the fastest-growing m-app economy in the developing world.

[180] Erik Hersman, Viewpoint "From Kenya to Madagascar : The African tech-hub boom", BBC.co.uk : http://www.bbc.co.uk/news/business-18878585
[181] Christine Zhenwei Qiang, Siou Chew Kuek, Andrew Dymond and Steve Esselaar, "Mobile Applicaions for Agriculture and Rural Development", ICT Sector Unit, World Bank, December 2011 p 45
[182] Praekelt Foundation report, 2012, Mobile statistics for Africa: http://www.youtube.com/watch?v=0bXjgx4J0C4

The GSM Association's Development Fund has a very interesting role in the deployment of the mobile revolution as it finds itself at the interface of mobile network operators, private entrepreneurs, investors and the technology communities. It acts as a referent in the telecom business to which any of the parties can come to for advice. It puts all its efforts in creating a win-win environment which can leverage the mobile technology to boost economic and social growth, which will in turn provide mobile operators with a healthier consumer market.

Another solution would be to use universal service funds to finance m-apps.[183] Although not used in Kenya, Charlotte Ward explained how universal service funds, or universal access funds (UAF), could promote the growth of m-apps. Under universal access funds, MNOs would be required to give a certain percentage of their profits to the fund which would be managed and governed by the Kenyan telecom regulator, (the Communication Commission of Kenya). Any operator could then pitch to use that money to expand their network and drive digital inclusion and reduce the digital divide, exclusively in rural areas.

These challenges remind of the road ahead for most countries of Africa if they want to embrace the mobile revolution and make most use of the mobile phone's potential for socio-economic growth. All actors need to jump into the game for this to come about, and as exemplified in Kenya, entrepreneurs and "techies" are key to show the way forward to governments, driving innovation and entrepreneurship in Africa and catching their national markets' needs. Governments are primordial to establish the right framework for African innovations to develop and African countries to become high-tech within the next few decades. Investors are required to make those innovations grow, at every stage of their development, from start-up to full-fledge commercialisation. NGOs and developments funds are also there to make sure the national packaging is adequate. It is a story that must be written collaboratively, each actor having their defined role to make M4D happen.

[183] Idem p 51

CONCLUSION

The story of Africa's mobile revolution is being written by Africans; constantly and rapidly evolving, it is transforming the continent's socio-economic landscape. The story differs from country to country as mobile technology has not been embraced at the same pace and a great gap exists today between countries like Kenya, South Africa, Nigeria, which have high mobile penetration, and others like Ethiopia, Niger or the Democratic Republic of Congo. The Republic of Kenya has been leading the way in Africa in terms of mobile adoption and its evolution highlights the opportunities and the challenges ahead.

It has been quite a way since the 1990 and the first discussion on ICT4D, unveiling the potential of information and communication technologies for social and economic growth, and then later focusing more particularly on M4D. Institutions have changed their ways of apprehending ICT4D and understood the need to establish a broad strategy which would take people as a starting point to ensure building adequate ICT policies.

Today, the mobile phone is considered by the World Bank as the best tool for development. In itself the technology is key as it offers a means of communication, increasingly available and affordable: for everyone, everywhere, at anytime. This personal device has empowered people, and insufflates a spirit of entrepreneurship and innovation in their minds. Its value added services make the mobile phone all the more powerful, finding innovative ways of delivering information and transferring knowledge even to the most remote regions of Africa. Mobile applications used in the sectors of agriculture, health and education have had the biggest impact on people's lives and can make a difference in the long term. For this to happen, all stakeholders – governments, mobile network operators, African ICT entrepreneurs, investors (local and international), NGOs, development funds and other donors, have to collaborate and invest in mobile technology, while keeping in mind a overall development strategy, in which ICT acts as an enabling – even amplifying – tool.

This is only the beginning of the story, and the World Bank has noted that Africa has reaped very little economic benefits form the increase in info-density. Broadband connection might help take Africa to the next step providing a broader variety of sophisticated services, such as MedAfrica. In 2004, there were 1.65 million active Internet users in the region, by 2010 the number jumped to 6.78 million, with a penetration rate of approximately 5 per cent of the

population. [184] In Kenya, 99 per cent of Internet subscriptions are on mobile phones[185], especially in rural communities who have limited access to electricity. This situation reflects the advent of a "Mobile Only" Internet generation and ICT entrepreneurs and developers are already thinking of how to adapt their models to internet-based services.

Mobile broadband, or wireless Internet access, is considered as "THE" solution by the International Telecommunication Union (ITU) and the e-learning report 2012 concludes that Africa's "biggest failure" in the last five years has been the inability to minimise regional inequalities in Internet access.[186] The World Bank 2009 report confirms the importance of broadband as it estimated that an extra 10 per cent broadband will translate into a 1.38 per cent economic growth[187]. Again, it is important to temper the enthusiasm in order to properly leapfrog, as Guy Zibi, Director of AfricaNext states: "The obstacles are numerous; limited infrastructure in key portions of the Internet network value chain; high cost of bandwidth and customer equipment, low literacy levels and small addressable markets. And yet the opportunity carries this perennially unique African blend of highly promising potential and often uncertain returns, setting the stage for the next phase of mobile market expansion on the continent."

This is a unique story that is taking place in a region of contrasts, combining modernity to traditions and entrepreneurship to poverty. The future of the mobile revolution in Africa is yet to be designed but as Kenya's story has been demonstrating, learning from mistakes and innovating through practice and use, challenges can be overcome, with all actors engaged, to make it right for each African country.

[184] Dr Rao Madanmohan, "Mobile Africa Report 2011, Regional Hubs of Excellence and Innovation", MobileMonday, March 2011, http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf, p 34
[185] The Economist, "Upwardly mobile, Kenya's technology start-up scene is about to take off", 25 August 2012
[186] The e-learning Africa 2012 Report, Sponsored by WYSE. : http://www.elearning-africa.com/pdf/report/ela_report_2012.pdf
[187] Idem

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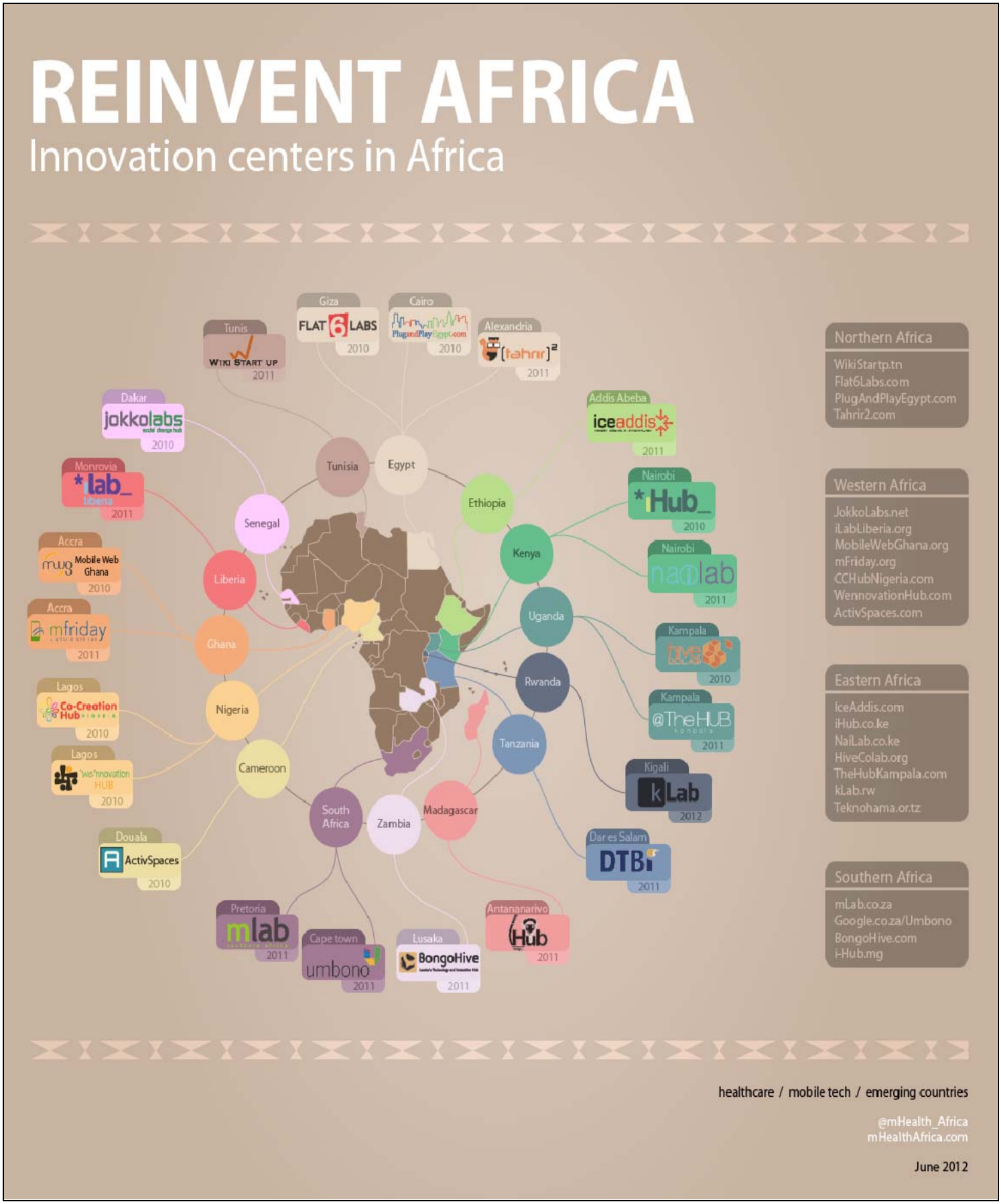
ANNEXE 1:



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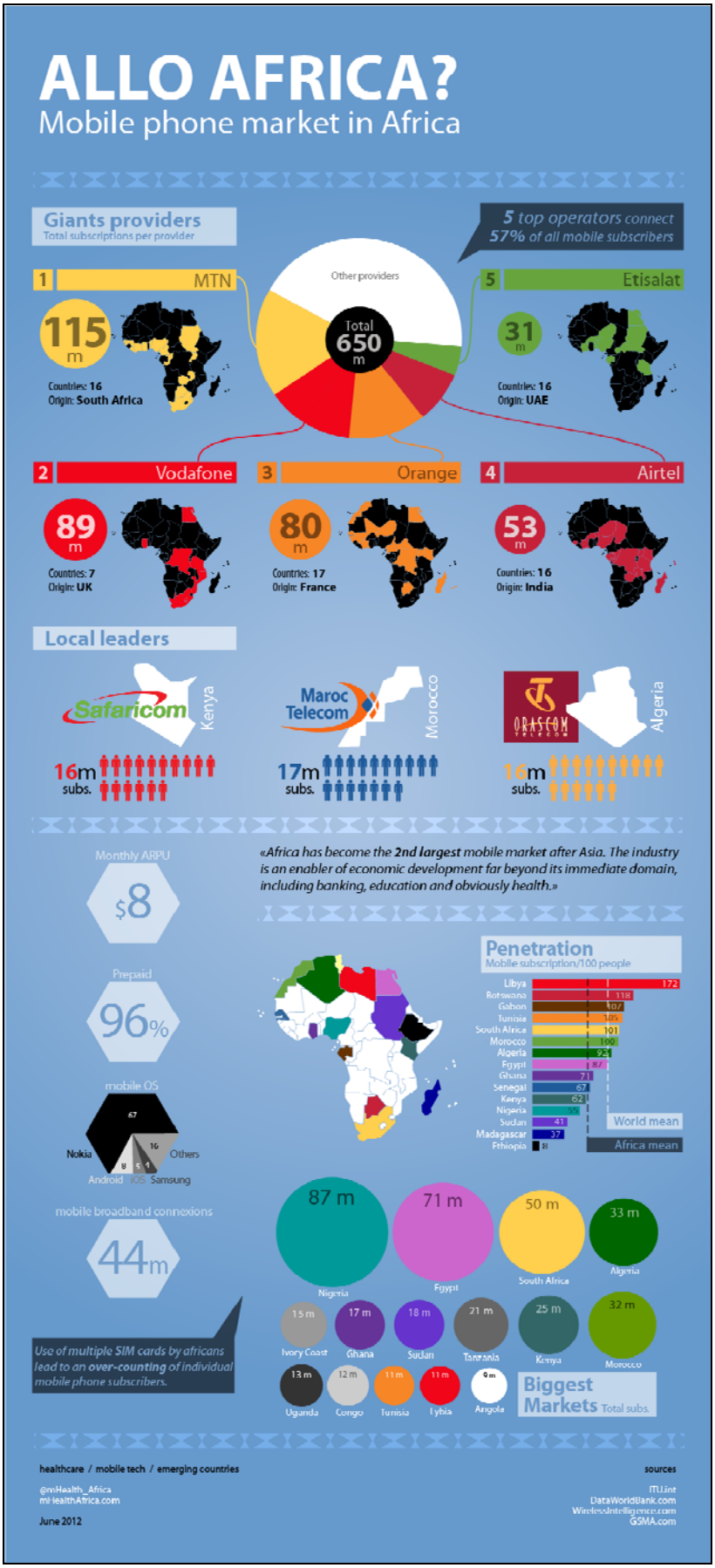
ANNEXE 2:



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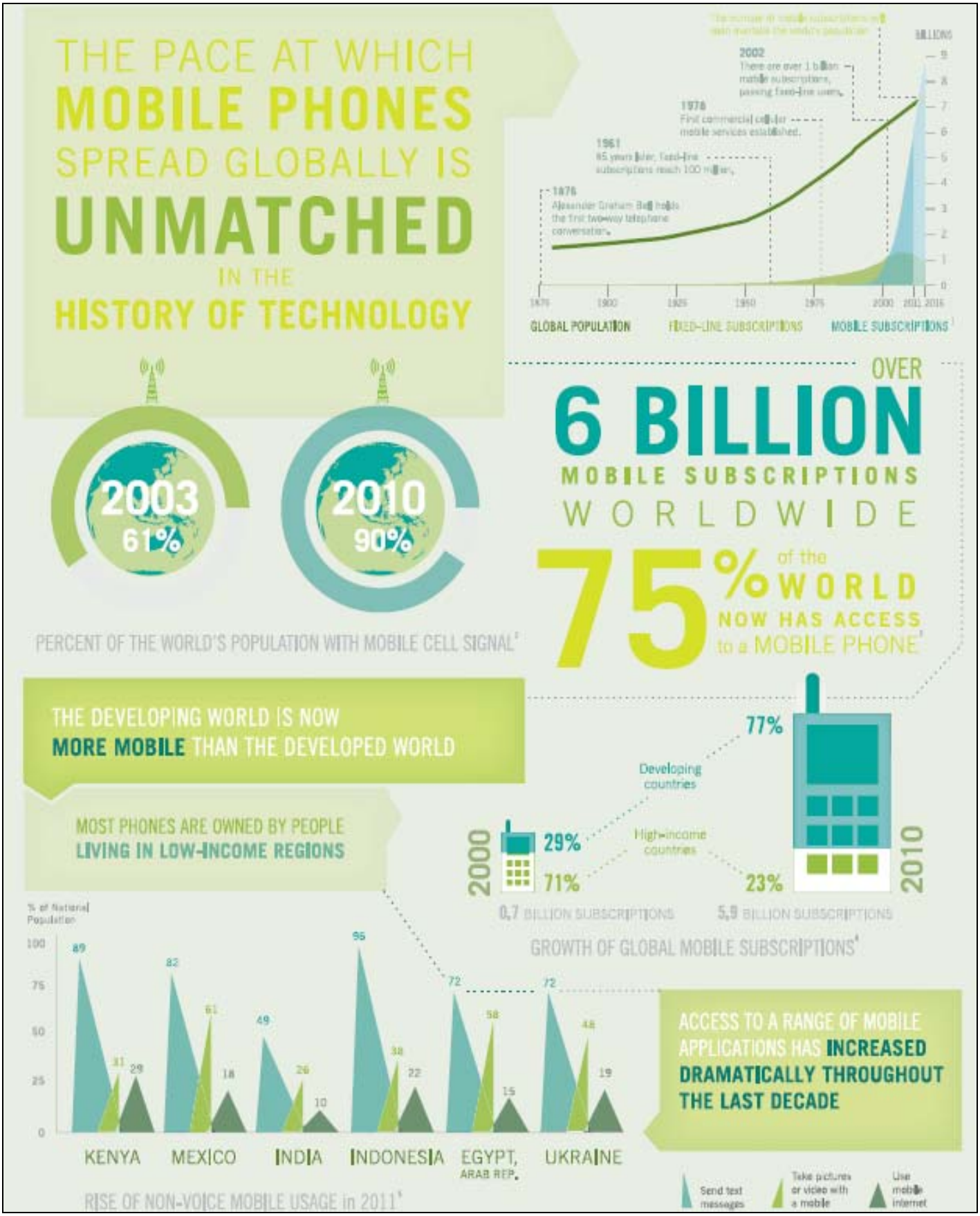
ANNEXE 3:



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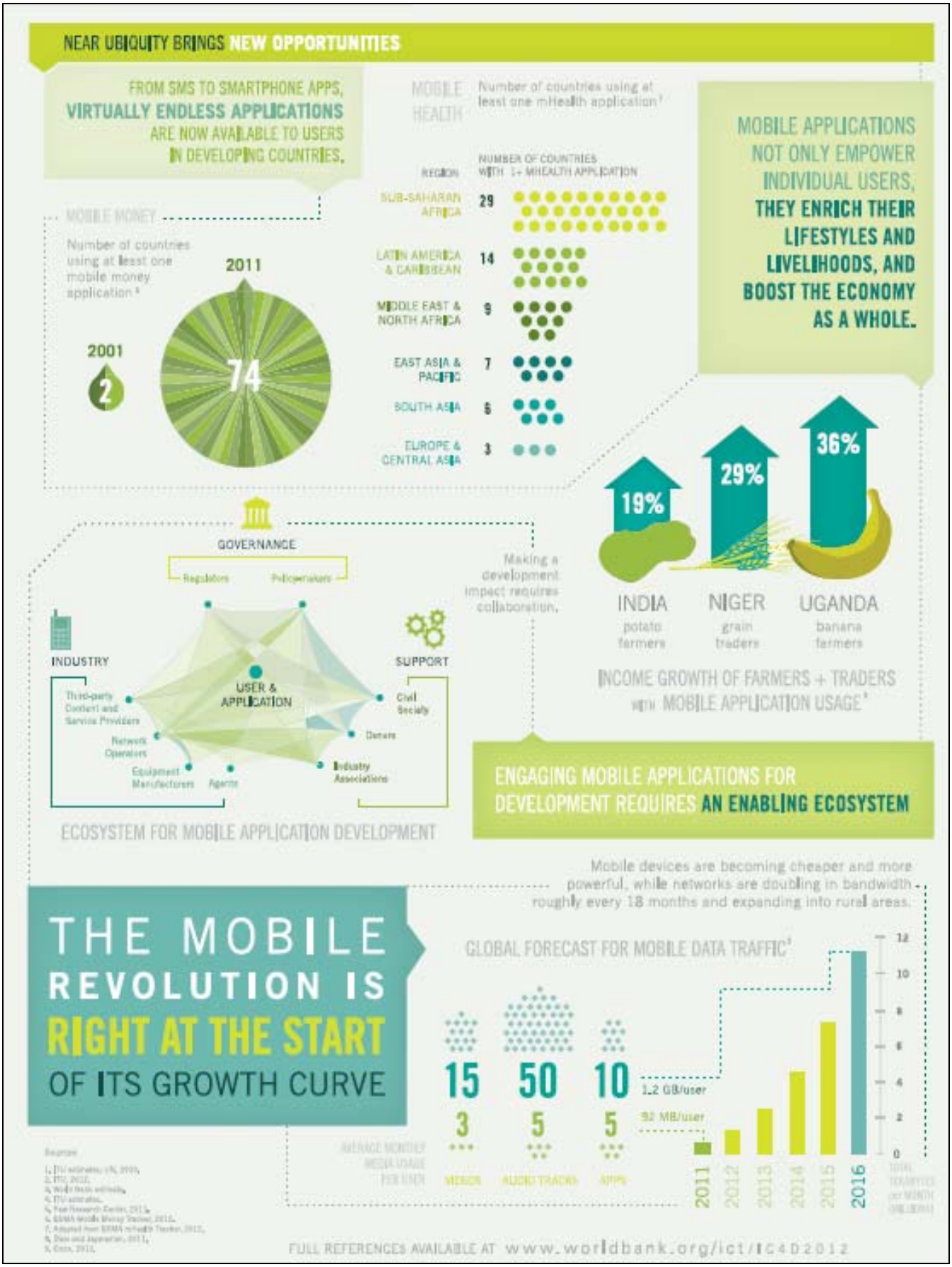
ANNEXE 4:



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